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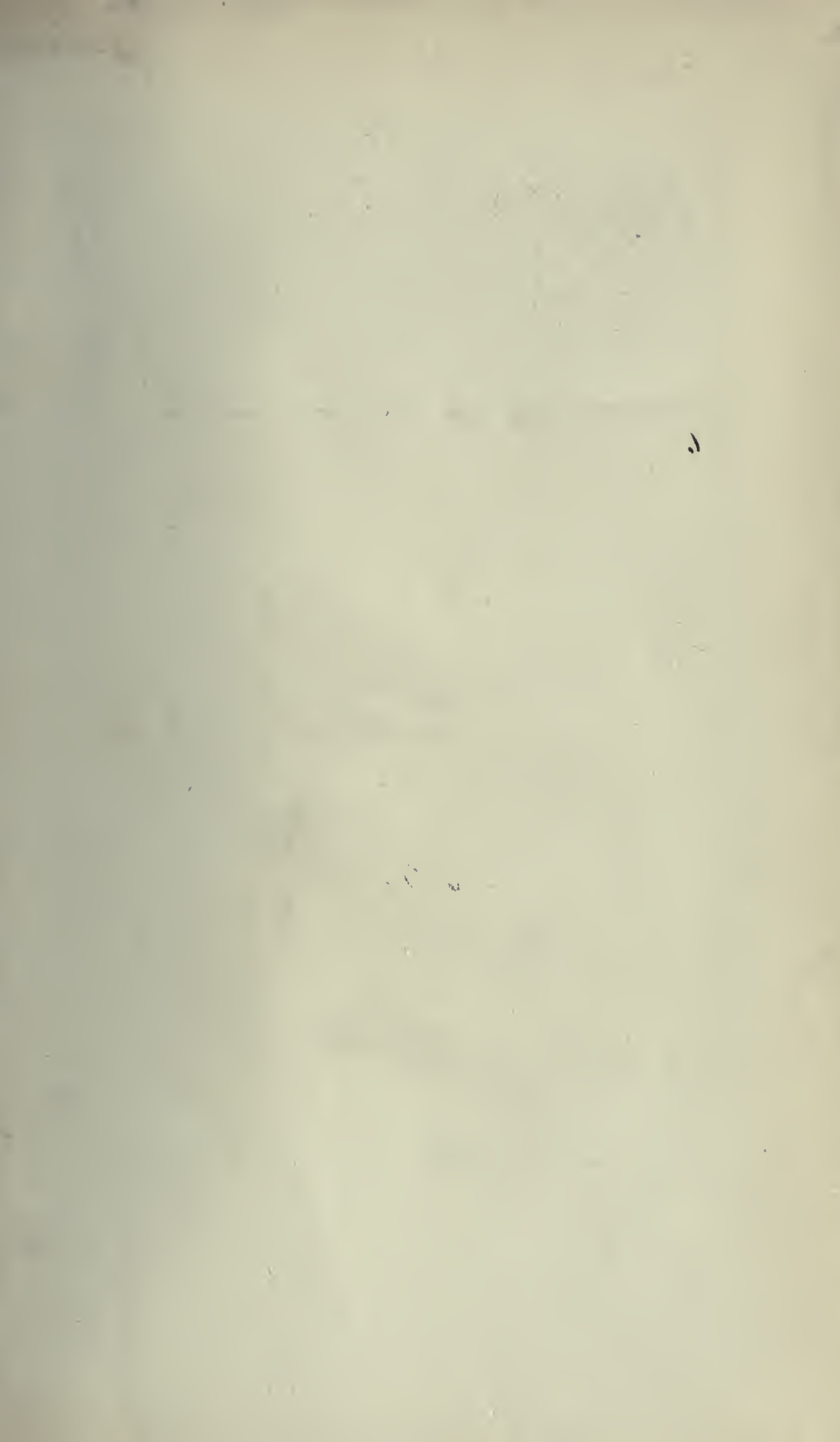


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ARCHIVES  
OF  
OPHTHALMOLOGY

*EDITED IN ENGLISH AND GERMAN*

BY

DR. H. KNAPP  
OF NEW YORK

AND

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OF BERLIN

DR. W. A. HOLDEN  
OF NEW YORK  
ASSISTANT EDITOR

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VOLUME XXXII.

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# CONTENTS OF VOLUME XXXII.

## NUMBER I.

	PAGE
1. On Recurrent Formation of Vesicles on the Cornea and Keratalgias after Injuries of the Surface of the Cornea. By Dr. W. STOOD, Barmen. Translated from <i>Arch. f. Augenheilk.</i> , xliii., 4 (1901), by Dr. WARD A. HOLDEN . . .	1
2. On Sclerosis of the Choroid with Secondary Degeneration of the Retina. By Dr. GEORG LEVINSOHN, Berlin. Translated by Dr. WARD A. HOLDEN. (With Plate XIV. of Vol. XXXVIII., German Edition) . . . . .	7
3. On a Mycotic Affection of the Cornea. By Prof. B. WICHERKIEWICZ, Cracow. Translated by Dr. WARD A. HOLDEN. (With two figures on Plate XXIII. of Vol. XL., German Edition) . . . . .	13
4. Review of Sixty-nine Cases of Rupture of the Choroid, Compiled from the Records of the New York Ophthalmic and Aural Institute. By Dr. F. E. D'OENCH, New York . . .	18
5. A Case of Localized Tuberculosis at the Head of the Optic Nerve; Microscopic Examination. By Dr. ARNOLD KNAPP. (With one figure on Text-Plate I.) . . . . .	22
6. A Method for the Prevention of Symblepharon after Burns of the Conjunctiva. By Dr. E. F. SNYDACKER, Assistant Surgeon, Illinois Eye and Ear Infirmary. (With two diagrams in text) . . . . .	25
7. Report of the Meeting of the German Ophthalmological Society at Heidelberg, August 4-6, 1902. By Prof. RICHARD GREEFF, Berlin. Translated by Dr. WARD A. HOLDEN . .	31
8. Report of the Meeting of the Ophthalmological Society of the United Kingdom, November 14, 1902. By Mr. C. DEVEREUX MARSHALL . . . . .	51
9. Report of the Meetings of the Ophthalmological Section of the New York Academy of Medicine, Held on Monday Evenings, October 20 and November 17, 1902. By Dr. HENRY H. TYSON, Secretary . . . . .	54

	PAGE
10. <b>Systematic Report on the Progress of Ophthalmology in the First Quarter of the Year 1902.</b> By Dr. G. ABELSDORFF, in Berlin; Prof. ST. BERNHEIMER, in Innsbruck; Dr. O. BRECHT, Prof. R. GREEFF, Prof. C. HORSTMANN, and Dr. R. SCHWEIGGER, in Berlin; with the assistance of Dr. A. ALLING, New Haven; Prof. E. BERGER, Paris; Dr. DALÉN, Stockholm; Dr. J. HERRNHEISER, Prague; Prof. HIRSCHMANN, Charcow; Dr. J. JITTA, Amsterdam; Dr. KRAHNSTÖVER, Rome; Mr. C. DEVEREUX MARSHALL, London; Dr. P. VON MITTELSTÄDT, Metz; Prof. DA GAMA PINTO, Lisbon; and others. Translated by Dr. WARD A. HOLDEN	62
A.—Prof. HORSTMANN: General ophthalmological literature, 62; General pathology, diagnosis, and therapeutics, 64; Instruments and remedies, 68.	
B.—Dr. G. ABELSDORFF: Anatomy, 71; Physiology, 72; Refraction and accommodation, 74; Muscles and nerves, 76.	
C.—Dr. R. SCHWEIGGER: Lids, 79; Lachrymal apparatus, 81; Orbit, 82; Conjunctiva, 82; Cornea, 84.	
D.—Dr. O. BRECHT: Lens, 88; Iris, 89. ( <i>To be Continued</i> ).	
11. <b>Book Reviews</b>	91
I.—A Treatise on Diseases of the Eye, Nose, Throat, and Ear. Edited by W. C. POSEY, A.B., M.D., and JONATHAN WRIGHT, M.D.	
II.—Die Motilitätsstörungen des Auges, von Dr. ERNEST E. MADDOX. Translated into German by Dr. W. ASHER, Leipzig, 1902.	
III.—Chirurgie de l'Œil et de ces Annexes. By Dr. F. TERRIEN.	
NUMBER 2.	
1. A Case of Primary Epibulbar Sarcoma, with Secondary Growths in Limbus and Sclera, and Invasion of the Choroid, Ciliary Body, and Iris. By FREDERICK H. VERHOEFF, M.D., and ROBERT G. LORING, M.D., Boston. (With four figures on Text-Plate II.)	97
2. The Accuracy Requisite in Vision-Testing. By Dr. KENNETH SCOTT	123
3. The Ophthalmoscopic Appearance of the Ora Serrata and the Ciliary Processes. By Dr. M. REIMAR, Brunswick. Translated by Dr. WARD A. HOLDEN. (With Plate IX. of Vol. XLI., German Edition)	130
4. On Indirect Ruptures of the Iris. By Dr. GEORG LEVINSOHN, Berlin. Slightly Abridged Translation, by Dr. WARD A. HOLDEN, from the German Edition, XLI., 1, March, 1900	134

	PAGE
5. On the Anatomy of the Ganglion Cells of the Retina. By Dr. G. ABELSDORFF, Berlin. Translated by Dr. WARD A. HOLDEN. (With eight figures on Plate XI. of Vol. XLII., German Edition, Nov., 1900) . . . . .	146
6. A Contribution to the Differential Diagnosis between Glioma of the Retina and Pseudoglioma. By Dr. JULIUS FEJÉR. Translated by Dr. WARD A. HOLDEN, from Vol. XLVI., 2 (1902), of the German Edition . . . . .	154
7. On Paralysis of Latero-Version. By Dr. OTTO WERNICKE, Buenos Aires. Translated from Vol. XLI., 1900, German Edition, by Dr. WARD A. HOLDEN. . . . .	163
8. Reports of the Meetings of the Ophthalmological Society of the United Kingdom. By Mr. C. DEVEREUX MARSHALL . . . . .	168
9. Report of the Meetings of the Ophthalmological Section of the New York Academy of Medicine, held on Monday Evenings, December 15, 1902, and January 19, 1903. By Dr. HENRY H. TYSON, Secretary . . . . .	172
10. Systematic Report on the Progress of Ophthalmology in the First Quarter of the Year 1902. By Dr. G. ABELSDORFF, in Berlin; Prof. ST. BERNHEIMER, in Innsbruck; Dr. O. BRECHT, Prof. R. GREEFF, Prof. C. HORSTMANN, and Dr. R. SCHWEIGGER, in Berlin; with the assistance of Dr. A. ALLING, New Haven; Prof. E. BERGER, Paris; Dr. DALÉN, Stockholm; Dr. J. HERRNHEISER, Prague; Prof. HIRSCHMANN, Charcow; Dr. J. JITTA, Amsterdam; Dr. KRAHNSTÖVER, Rome; Mr. C. DEVEREUX MARSHALL, London; Dr. P. VON MITTELSTÄDT, Metz; Prof. DA GAMA PINTO, Lisbon; and others. Translated by Dr. WARD A. HOLDEN. ( <i>Continued from page 90</i> ) . . . . .	181
A.—Dr. O. BRECHT: Choroid, 181; Vitreous, 184; Glaucoma, 185; Sympathetic ophthalmia, 186.	
B.—Prof. GREEFF: Retina and functional disturbances, 186; Optic nerve, 190; Injuries, foreign bodies, parasites, 191; Ocular disturbances in general diseases, 194.	
11. Systematic Report on the Progress of Ophthalmology during the Second and Third Quarters of the Year 1902 . . . . .	197
A.—Prof. HORSTMANN: General ophthalmological literature, 197; General pathology, diagnosis, and therapeutics, 200; Instruments and remedies, 205.	
12. Book Notices . . . . .	207
IV.—Die Refraction u. Accommodation des menschlichen Auges u. ihre Anomalien. By Prof. C. HESS, M.D.	
V.—Spectacles and Eyeglasses. By R. J. PHILLIPS, M.D.	

## NUMBER 3.

PAGE

1. The Proper Division and Fixation of the Skin Flaps in the Operation for Cicatricial Ectropium to Prevent Re-Eversion. By Dr. F. C. HOTZ, Chicago. (With two figures on Text-Plate III.) . . . . . 209
2. Chronic Empyema of the Ethmoidal and Frontal Sinuses, with Exophthalmos; Operation; Death from Meningitis; Autopsy. By Dr. ARNOLD KNAPP . . . . . 214
3. Y-Shaped Rupture of the Choroid in the Macula Region with Retention of Good Vision. By Dr. J. J. MILLS, Baltimore, Md. (With Text-Plate IV.) . . . . . 217
4. A Contribution to the Pathology of Anomalies of the Vessels and the Formation of Stripes in the Retina. By Dr. RUDOLF SCHILLING, Freiburg-in-Br. Translated from *Arch. f. Augenheilkunde*, xliii., March, 1901, by Dr. WARD A. HOLDEN. (With Plates I.-II. of Vol. XLIII., German Edition) . . . . . 219
5. The Antiseptic Tattooing of the Cornea. By Dr. L. DE WECKER, Paris. Translated from *Arch. f. Augenheilkunde*, xxxix., 4, August, 1899, by Dr. WARD A. HOLDEN . . . . . 254
6. On the Histology of Bullous Keratitis in Glaucomatous Eyes. By G. E. DE SCHWEINITZ, A.M., M.D., and E. A. SHUMWAY, M.D., Philadelphia. (With Text-Plates V. and VI.) . . . . . 257
7. A Test for Central Color-Perception. By Dr. PERCY FRIDENBERG. (With one text cut) . . . . . 269
8. Reports of the Meetings of the Ophthalmological Society of the United Kingdom. By Mr. C. DEVEREUX MARSHALL . . . . . 272
9. Reports of the Meetings of the Ophthalmological Section of the New York Academy of Medicine, held on Monday Evenings, February 16 and March 16, 1903. By Dr. HENRY H. TYSON, Secretary . . . . . 279
10. Systematic Report on the Progress of Ophthalmology in the Second and Third Quarters of the Year 1902. By Dr. G. ABELSDORFF, in Berlin; Prof. ST. BERNHEIMER, in Innsbruck; Dr. O. BRECHT, Prof. R. GREEFF, Prof. C. HORSTMANN, and Dr. R. SCHWEIGGER, in Berlin; with the assistance of Dr. A. ALLING, New Haven; Prof. E. BERGER, Paris; Dr. DALÉN, Stockholm; Dr. J. HERRNHEISER, Prague; Prof. HIRSCHMANN, Charcow; Dr. J. JITTA, Amsterdam; Dr. KRAHNSTÖVER, Rome; Mr. C. DEVEREUX MARSHALL, London; Dr. P. VON MITTELSTÄDT, Metz; Prof. DA GAMA PINTO, Lisbon; Dr. HEINRICH SCHULZ; and others. Translated by Dr. WARD A. HOLDEN . . . . . 292



A.—Dr. G. ABELSDORFF: Anatomy, 292; Physiology, 293; Refraction and accommodation, 298; Muscles and nerves, 300.

B.—Dr. R. SCHWEIGGER: Lids, 306; Lachrymal apparatus, 307. (*To be Continued.*)

11. **Miscellaneous Notes** . . . . . 310  
Obituary—Prof. Photinos Panas; Dr. David Little; Prof. Isidor Herrnheiser; Prof. Alfred Graefe; Dr. J. W. May; Dr. F. Despagnet; Dr. Tatchuchiro Inouye, Jr.; Dr. Nathaniel Feuer.  
Appointments and News.  
Bequests, Gifts, and Purchases.
12. **Book Notices** . . . . . 316  
VI.—Biographic Clinics. By GEORGE M. GOULD, M.D.

---

NUMBER 4.

1. **Aplasia of the Papilla and Retinal Vessels with a Peculiar Anomaly at the Macula in Eyes Otherwise Normal.** By Dr. ALEXANDER DUANE, New York. (With two text-figures) . . . . . 319
2. **Retinal Rosette Formations of Neuroglia in Inflammatory Processes.** By BROWN PUSEY, M.D. (With two text-figures) 325
3. **Cytotoxins and Sympathetic Ophthalmia.** By Dr. BROWN PUSEY . . . . . 334
4. **On Congenital Cysts of the Eyeball and Their Development.** By Prof. C. HESS, Würzburg, Germany. Abridged Translation from *Archiv f. Augenheilkunde*, xli., 1, March, 1900, by Dr. WARD A. HOLDEN. (With ten figures on Plates I.-II., *Arch. f. A.*, XLI.) . . . . . 339
5. **Asthenopia Dependent on Neurasthenia and Hysteria.** By Dr. H. GRADLE, Chicago . . . . . 350
6. **Double Optic Neuritis Complicating Whooping-Cough.** By WILLIAM E. GAMBLE, B.S., M.D., Chicago . . . . . 359
7. **Periscopic Lenses.** By A. S. PERCIVAL, M.B., B.C., Cambridge, Eng. . . . . 367
8. **Polypus of the Lower Canaliculus.** By S. C. AYRES, M.D., Cincinnati . . . . . 369
9. **The Extirpation of the Lachrymal Sac; Its Indications and Technique.** By Dr. ARNOLD KNAPP . . . . . 372
10. **The Mental Derangement Which is Occasionally Developed in Patients in Eye Hospitals.** By CHARLES J. KIPP, M.D., Newark, N. J. . . . . 375

	PAGE
11. Report of the Meetings of the Ophthalmological Section of the New York Academy of Medicine, Held on Monday Evenings, April 20 and May 18, 1903. By Dr. HENRY H. TYSON, Secretary . . . . .	388
12. Report of the Meeting of the Ophthalmological Society of the United Kingdom, May 8, 1903. By C. DEVEREUX MARSHALL, F.R.C.S. . . . .	399
13. Systematic Report on the Progress of Ophthalmology in the Second and Third Quarters of the Year 1902. By Dr. G. ABELSDORFF, in Berlin; Prof. ST. BERNHEIMER, in Innsbruck; Dr. O. BRECHT, Prof. R. GRÉEFF, Prof. C. HORSTMANN, and Dr. R. SCHWEIGGER, in Berlin; with the assistance of Dr. A. ALLING, New Haven; Prof. E. BERGER, Paris; Dr. DALÉN, Stockholm; Dr. J. HERRNHEISER, Prague; Prof. HIRSCHMANN, Charcow; Dr. J. JITTA, Amsterdam; Dr. KRAHNSTÖVER, Rome; Mr. C. DEVEREUX MARSHALL, London; Dr. P. VON MITTELSTÄDT, Metz; Prof. DA GAMA Pinto, Lisbon; Dr. HEINRICH SCHULZ; and others. Translated by Dr. WARD A. HOLDEN . . . . .	402

(Continued from page 309.)

B.—Dr. R. SCHWEIGGER: Orbit and accessory sinuses, 402; Conjunctiva, 407. (To be Continued.)

#### NUMBER 5.

1. Clinical Contributions to the Knowledge of Rare Affections of the Conjunctiva and Skin of the Lids. By Prof. J. v. MICHEL, Berlin. Abridged Translation by Dr. WARD A. HOLDEN. (With six colored figures on Plates I.-II. of Vol. XLII., 1-2 (1900), of the German Edition) . . . . .	415
2. Epiphora as an Initial Symptom of Basedow's Disease. By Dr. E. BERGER, Paris. Slightly Abridged Translation from Vol. XLVI., 2 (1902), German Edition, by Dr. WARD A. HOLDEN . . . . .	423
3. Experiments on Endogenous Infection of the Eye. By Dr. J. SELENSKOWSKY and Dr. M. WOJZECZOWSKY, St. Petersburg. Translated from <i>Arch. f. Augenheilk.</i> , xlvii., April, 1903, by Dr. MATTHIAS LANCKTON FOSTER . . . . .	430
4. The Value of Ophthalmic Examinations in the Differential Diagnosis between Typhoid Fever and Acute Miliary Tuberculosis. By CLARENCE LOEB, A.M., M.D. (With two text-cuts) . . . . .	453
5. Buphthalmos in a Subject of Congenital Dislocation of the Crystalline Lens. By Dr. F. W. MARLOW, Syracuse, N. Y. . . . .	470

6. **Systematic Report on the Progress of Ophthalmology in the Second and Third Quarters of the Year 1902.** By Dr. G. ABELSDORFF, in Berlin ; Prof. ST. BERNHEIMER, in Innsbruck ; Dr. O. BRECHT, Prof. R. GREEFF, Prof. C. HORSTMANN, and Dr. R. SCHWEIGGER, in Berlin ; with the assistance of Dr. A. ALLING, New Haven ; Prof. E. BERGER, Paris ; Dr. DALÉN, Stockholm ; Dr. J. HERRNHEISER, Prague ; Prof. HIRSCHMANN, Charcow ; Dr. J. JITTA, Amsterdam ; Dr. KRAHNSTÖVER, Rome ; Mr. C. DEVEREUX MARSHALL, London ; Dr. P. VON MITTELSTÄDT, Metz ; Prof. DA GAMA PINTO, Lisbon ; Dr. HEINRICH SCHULZ ; and others. Translated by Dr. WARD A. HOLDEN . . . . . 473

(Continued from page 414.)

B.—Dr. R. SCHWEIGGER : Cornea, sclera, anterior chamber, 473.

C.—Dr. O. BRECHT : Lens, 480 ; Iris, 484 ; Choroid, 485 ; Vitreous, 487 ; Glaucoma, 488 ; Sympathetic ophthalmia, 492.

D.—Dr. v. HASELBERG : Retina and functional disturbances, 493 ; Optic nerve, 497 ; Injuries, foreign bodies, parasites, 497 ; Ocular disturbances in general diseases, 500.

7. **Book Reviews** . . . . . 505

VII.—The Practical Details of Cataract Extraction. By H. HERBERT, F.R.C.S.

VIII.—A Manual of Diseases of the Eye, for Students and General Practitioners. By CLARENCE A. VEAZEY, A.M., M.D.

IX.—The Refraction and Motility of the Eye, for Students and Practitioners. By WILLIAM NORWOOD SUTER, M.D.

X.—Squint : Its Causes, Pathology, and Treatment. By CLAUD WORTH, F.R.C.S.

XI.—The Ocular Circulation. By J. HERBERT PARSONS, B.S., B.Sc., F.R.C.S.

XII.—Klinischer Leitfaden der Augenheilkunde. Von Dr. JULIUS v. MICHEL.

XIII.—Entre Aveugles. Conseils à l'usage des personnes qui viennent de perdre la vue. Par le Dr. ÉMILE JAVAL.

XIV.—Golden Rules of Refraction. By ERNEST MADDOX, M.D., F.R.C.S.

XV.—Eye Symptoms as Aid in Diagnosis. By EDW. MAGENNIS, M.D., D.P.H.

8. **Announcements.** The Ophthalmoscope ; a monthly review of current ophthalmology.—International Ophthalmological Congress . . . . . 515

## NUMBER 6.

	PAGE
1. <b>On Glaucoma.</b> By Prof. K. R. WAHLFORS, Helsingfors. Abridged Translation from Vol. XLVII., 1, of German Edition, March, 1903, by Dr. WARD A. HOLDEN . . . . .	517
2. <b>A Clinical Contribution to Traumatic Enophthalmus.</b> By Dr. PURTSCHER, Klagenfurt. Abridged Translation from Vol. XXXVIII., 2 (1898), of the German Edition, by Dr. WARD A. HOLDEN . . . . .	541
3. <b>The So-called Embolism of the Central Artery of the Retina and of its Branches.</b> By Dr. MAX REIMAR, of Zurich. Abridged Translation from <i>Arch. f. Augenheilk.</i> , xxxviii., March, 1899, by Dr. MATTHIAS LANCKTON FOSTER. (With Plate XX. of Vol. XXXVIII., German Edition) . . . . .	552
4. <b>Systematic Report on the Progress of Ophthalmology in the Fourth Quarter of the Year 1902.</b> By Dr. G. ABELSDORFF, in Berlin; Prof. ST. BERNHEIMER, in Innsbruck; Dr. O. BRECHT, Prof. R. GREEFF, Prof. C. HORSTMANN, and Dr. R. SCHWEIGGER, in Berlin; with the assistance of Dr. A. ALLING, New Haven; Prof. E. BERGER, Paris; Dr. DALÉN, Stockholm; Dr. J. HERRNHEISER, Prague; Prof. HIRSCHMANN, Charcow; Dr. J. JITTA, Amsterdam; Dr. KRAHNSTÖVER, Rome; Mr. C. DEVEREUX MARSHALL, London; Dr. P. VON MITTELSTÄDT, Metz; Prof. DA GAMA PINTO, Lisbon; Dr. HEINRICH SCHULZ; and others. Translated by Dr. WARD A. HOLDEN . . . . .	593
<p>A.—Dr. C. HORSTMANN: General ophthalmological literature, 593; General pathology, diagnosis, and therapeutics, 596; Instruments and remedies, 599.</p> <p>B.—Dr. G. ABELSDORFF: Anatomy, 600; Physiology, 601; Refraction and accommodation, 602; Muscles and nerves, 605.</p> <p>C.—Dr. R. SCHWEIGGER: Lids, 608; Lachrymal apparatus, 609; Orbit and neighboring cavities, 611; Conjunctiva, 612; Cornea, 615.</p>	
5. <b>Book Notices</b> . . . . .	617
<p>XVI.—Hermann von Helmholtz. By LEO KÖNIGSBERGER.</p> <p>XVII.—A Handbook of Diseases of the Eye and their Treatment. By HENRY R. SWANZY, A.M., M.B., F.R.C.S.I.</p>	
6. <b>Announcement of International Ophthalmological Congress.</b> Supplement of Details . . . . .	620
7. <b>Index</b> . . . . .	623



## ARCHIVES OF OPHTHALMOLOGY.

ON RECURRENT FORMATION OF VESICLES ON THE  
CORNEA AND KERATALGIAS AFTER INJURIES  
OF THE SURFACE OF THE CORNEA.

OMISSION.

VOL. XXXI., NO. 6.

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“KIPP, Extraction of Iron from the Vitreous by Giant  
Magnet—A New Method, 391.”

cases of eye disease I have recognized this clinical picture sixty times. The development and the course of the different cases are so similar and there are so few variations that I need not cite case histories, but only describe a type, which, with a few modifications to be alluded to later, will make the process clear.

In the beginning there is a superficial injury of the cornea usually caused by a sudden, rather blunt force. An infant scratches its mother's eye with a finger nail, a pointed leaf scratches the cornea, or a flying splinter of wood strikes the cornea tangentially. These injuries have, in common, the severity of the half blunt force and the tangential direction of its action. The result is a more or less extensive scraping off of the epithelium. The membrane of Bowman, so far as can be discovered with a loupe, remains uninjured. The injury heals in a few days and the patient believes that the recovery is to be permanent. There is neither pain nor inflammation, and vision becomes normal again. After some

weeks, or even as long as six months, the patient experiences pain on awaking, and feels that he cannot open the eye or raise the upper lid, which seems to be adherent to the ball. If the eye is forcibly opened, considerable pain is caused, lachrymation ensues, there is photophobia, and winking is painful. After half an hour or an hour, the symptoms subside and the patient may be able to take up his usual work. Examined at this time, a clear vesicle will be found beneath the epithelium, or a slight displacement of the epithelium at the site of the previous injury. Later in the day often nothing abnormal is to be found.

On questioning the patient, it may be found that the symptoms have appeared regularly on awaking for a considerable time, that the eye has been sensitive to the touch at the point of previous injury, and that smoke, dust, and conjunctival irritation increase the symptoms or cause them to appear more readily, so that he regards them of little importance, and questioning alone brings out the history. Sometimes the patient is seen in the intervals when nothing pathological can be found in the cornea, and the history alone makes clear the nature of the affection.

If one can see the patient early in the morning, the epithelial changes are clearly marked, but after three to five hours they may have disappeared entirely. These mild attacks of pain, with or without objective changes, are frequently the forerunners of a marked actual formation of vesicles on the cornea. In severe cases the lids become swollen, and the eyeball red and inflamed, and there are lachrymation, photophobia, and pain. The irritation is greater than at the time of the primary injury. Tension is not increased. The vesicle bursts, or is ruptured by the movement of the lid, and the defect is repaired without permanent changes being left, best under a protecting bandage. The pain soon subsides after rupture of the vesicle, which I usually detach with the forceps. In a week the eye is white again and free from irritation, and the site of the vesicle is not to be found.

In rare cases there are infiltration of the floor of the vesicle, hypopyon, and chemosis of the bulbar conjunctiva.

These, however, are but accidental complications, secondary infections, requiring antiseptic treatment or even the galvano-cautery and attention to the tear passages. A scar usually remains. These cases rarely recur.

But in the rarest cases the eye becomes quiet after the single eruption of vesicles. As a rule, however, there are recurrences after intervals of varying length, sometimes as long as three to six months, with eventual recovery. The latest recurrence that I have observed came on after two years. The intervals are frequently broken by mild attacks of pain in the morning, though sometimes the patient is even at this time free from annoyance. In other cases there is no visible formation of vesicles and the clinical picture is limited to the subjective characteristic annoyance of the patient. Such cases are particularly those in which the injury was a scratch or was merely a point—for example, the injuries produced by the point of a palm-leaf.

Thus the clinical picture varies in its development, but the varieties are only grades of the same process. After the healing of a superficial injury of the cornea, without involvement of Bowman's membrane, there develop after a varying interval, in which there have been but slight if any attacks of pain, clear, watery vesicles at the site of the previous injury, accompanied by severe ciliary pain and signs of inflammation. The surface of the vesicles becomes cloudy, breaks down, and is torn away, to be replaced in a short time by new transparent epithelium.

In all the attacks a characteristic feature is, that the pain is most severe on awaking from sleep. The patients all say that they are then unable to open the eye, that the lid is adherent, and that when the eye is forced open they have a sensation as of something being torn away. If the upper lid is first massaged lightly with the finger the severe pain is mostly avoided and the eye can be better opened.

Epithelial defects due to the scratching of cinders and dust or to clean cuts with a sharp knife do not, so far as my observation goes, lead to bullous keratitis, nor do cauterizations with ammonia, lime, and the like. There must always be a forcible tearing of the epithelium.

In the literature, Arlt in 1875 first described this condition as *erosio corneæ*. In 1884 Hansen at the Copenhagen congress reported cases as *keratitis bullosa* and attributed the recurrences which appeared weeks or months later to slight fresh injuries. In 1887 Horstmann reported at the meeting of naturalists in Wiesbaden a case in which a vesicle recurred nine times and definite recovery was brought about by the use of the constant current. He believed the affection to be a neurosis like herpes zoster. Grandclément observed the condition several times and described it in 1888 and 1889 as *keratalgia traumatica recidiva*, but he never had been able to discover vesicles upon the cornea. He believed that there was a neuritis of the terminations of the nerves. In 1889 Bronner and Nettleship wrote on the subject and recommended excision of the scar of the galvano-cautery in order to prevent the painful recurrences. In 1891 Nieden recommended the galvano-cautery even when the erosions were central. In 1896 Göring, after scraping and cauterizing the erosion in vain, obtained a cure after puncture of the cornea. In 1897 Szili and Weiss recommended the use of salves and called attention to the importance of the mechanical relations. In 1898 Hirsch reported two cases of recurrent erosion of the cornea, explaining them as traumatic neuritis of the nerve-endings with trophic disturbances, and recommending quinine. He believed that *keratalgia* and *keratitis bullosa* were but slightly different. In 1898 v. Schroeder also reported eight cases, considering *keratalgia* and *keratitis bullosa* as but slightly different, and recommended applications of 20 % silver solution. Von Reuss, on the contrary, opposed the idea of a neuralgia or neuritis, recognized only the mechanical factors, and distinguished two forms: painful attacks without objective lesions, and the development of vesicles.

Wicherkiewicz in 1899 again took up the neuritis or nerve-ending idea and considered the formation of vesicles an accompanying symptom but not an identical affection.

Among the text-books Fuchs alone, as far as I know, mentions the affection, following Arlt's designation: *erosio*



corneæ. Praun in his *Die Verletzungen des Auges*, 1899, discusses the matter more in detail and cites the literature. He recommends, after thorough disinfection of the conjunctiva, the use of warm wet dressings of boracic acid or bichloride solution until the epithelium regains its lustre. He believes that in this way he has best prevented recurrences.

The conceptions of the clinical picture differ greatly. In my own experience the primary injury heals readily under aseptic precautions or even without any treatment. But whether the wound has healed under a pressure bandage or not there is no difference in the matter of recurrences. If these take place, I have removed the wall of large vesicles with forceps and allowed the epithelial covering to be restored under an antiseptic dressing. As soon as the covering was restored, and in the cases of smaller or imperceptible vesicles, at once I have begun the treatment with salves and massage. Yellow oxide of mercury 1 % or boric acid in lanolin is rubbed into the eye at bedtime and left for five minutes. Then the excess is forced out by rubbing the upper lid in a circle over the cornea with gentle pressure. Thus a delicate coating of the salve is left on the cornea and lids, which prevents the drying of the fresh epithelium or its adhesion to the lid. When the patient awakes, before the eye is opened, mild massage of the upper lid and then of the cornea with the upper lid is performed and later the salve introduced into the eye.

In the thirteen years in which I have used this treatment the recurrences have been few and not severe. Rarely have there been more than two or three, often there has been but one provided the treatment was carried out properly. The galvano-cautery has been used only when the wound was infected, and internal medication has not been employed.

From my observations I have concluded that the process is not a neuritis of the nerve-endings in the corneal epithelium with consecutive trophic disturbances, as many writers maintain. I would seek the explanation in the anatomical relations and position of the deepest cylindrical

layer of epithelium, which, according to Rollett, Lott, and Langerhans, adheres to Bowman's membrane by means of little processes which pass into the clefts and furrows of the membrane. In the forcible injury the entire epithelium is stripped off for a distance and perhaps Bowman's membrane is crushed in its anterior layers, so that the new epithelial cells pushing in from the margins of the defect find an altered base upon which to rest and their adhesion to it is less strong. The new-formed epithelium rather rests simply upon Bowman's membrane, and at night it becomes attached to the lid and is loosened and its nerve-endings injured when the lids are opened. There follows then a passage of liquid from the parenchyma of the cornea through the nerve canals in Bowman's membrane so that a vesicle is formed.

If the vesicle is large, the overlying epithelium is so altered in its nutritive relations that it breaks down. If small, when the eye is opened the subepithelial transudation is absorbed.

This conception of a poor development of the foot-plates of the basal cells and of their weak attachment to Bowman's membrane explains also the good effects of massage. First, the entrance of the cellular processes into Bowman's membrane is facilitated, and the adhesions which form between cornea and lid during sleep are gradually loosened instead of being abruptly ruptured by the sudden opening of the eye, with injury to the cells.

In these cases I can heartily recommend the treatment with salves and massage, and I believe that we need not longer resort to the sharp spoon, the galvano-cautery, puncture of the anterior chamber, or excision of the affected portion of the cornea.

## ON SCLEROSIS OF THE CHOROID WITH SECONDARY DEGENERATION OF THE RETINA.

BY DR GEORG LEVINSOHN, BERLIN.

Translated by Dr. WARD A. HOLDEN.

(With Plate XIV. of Vol. XXXVIII., German Edition.)

CLINICAL observations on changes in the choroidal vessels have hitherto rarely been made, because of the difficulty or even impossibility of recognizing slight alterations in vessels that are covered by a membrane. Furthermore, affections of the choroid usually soon involve the retina also, which loses its transparency and prevents an accurate examination of the choroid. Therefore the observations hitherto made of changes in the choroidal vessels visible with the ophthalmoscope have been limited to the marked changes which age brings about, namely, sclerosis of these vessels. But even observations of this sort are rare. Thus in *Graefe-Saemisch*, de Wecker states that in very large scleral staphylomata the vessels often appear surrounded by white sheaths, and he quotes an observation of Knapp's in which this appearance is described as perivascularitis choroideæ. In the latest edition of Haab's atlas, plate 75 represents a very marked case of sclerosis of the choroidal vessels for a distance of  $1-1\frac{1}{2}$  p. d. about the disc; and Haab remarks that less extensive cases, in which the vascular changes are limited to a small area of the fundus, are not rare. The following case, resembling these, is of great interest because it exhibits clearly very marked changes in the choroidal vessels and because it presents a certain similarity to a clinical picture

recently observed by Fuchs and by him designated *atrophia gyrata choroideæ et retinæ*.

The patient was a tradesman of sixty, of sound, healthy constitution. He had passed through three military campaigns, had been married for 33 years, and had two children. He had never been seriously ill, had never had syphilis, there had not been abuse of tobacco or alcohol, and there was no consanguinity of parentage. Urine normal.

For about seven years the patient has noticed a diminution of vision. The weakness of vision is more manifest in the evening and now has become so excessive that he is unable to go about alone in the evening.

The functional condition of the eye has changed but slightly in the last six months while the patient has been under our observation. Apart from the reduction of the light sense, which has remained fairly constant, vision six months ago was R  $\frac{4}{7}$ , L  $\frac{4}{10}$  and now is R  $\frac{4}{10}$ , L  $\frac{4}{15}$ . With +3, Schw. 0.4 at 25 cm. The field of vision also has remained almost unchanged. Six months ago the fields were concentrically contracted down to  $10^\circ$  from the point of fixation, except for a narrow circular peripheric zone  $10^\circ$  wide, interrupted above. The color sense at the point of fixation was normal in the two eyes. Now the condition of the fields is as before, except that the peripheric zone of vision has been broken downward and inward in the left eye.

The objective examination reveals the following condition: The pupils are slightly irregular in form and react sluggishly to light and in convergence. In both lenses are slight senile changes limited to the equator. The posterior portion of the vitreous is filled with numerous punctate, slightly moving opacities. The anterior portion of the vitreous is free. The condition of the fundus also is nearly identical in both, so only the left fundus need be described. The disc has a red color, but on the whole appears pale. The veins are slightly constricted, the arteries markedly so. About the disc the fundus presents the picture of advanced atrophy of the choroid. This may be divided into three zones. The disc is surrounded by a narrow light zone, yellowish-red in color,



broken below by a small patch of normal red color (Plate XIV). To the macular side is a light red area, about 3 p.d. in diameter, whose centre, corresponding to the macula, appears dark red. To the nasal side and above and below the disc are large white or yellowish fields between which isolated bits of red fundus can be seen. The limits of these white fields and the light red macular area are characterized by brown pigmentation of the choroid. There then follows a broad circular zone reaching to the equator, which is noticeably lighter than the normal fundus, and in it the choroidal vessels are clearly seen enclosed in more or less intensely white sheaths, sometimes, however, bordering one side of the vessel only. At some points the blood column is no longer visible and the vessel is indicated by a white stripe. The arrangement of the various vessels is manifold. Occasionally white-sheathed vessels or white stripes pass over into normal red vessels; the latter then are mostly very tortuous.

The white-sheathed vessels can be followed into the circumpapillary zone, and in the other direction out beyond the equator. Here and there, besides the white fields, small areas of white color are visible, into which usually a small vessel enters. It is noticeable that the vessels entering the *venæ vorticosæ* exhibit the same changes, though in lesser degree. The twigs coming from the anterior part of the fundus and the main trunks have a normal appearance, but the branches posteriorly mostly have white sheaths. From the equator forward the fundus has a fairly normal appearance, except for the presence of small round atrophic choroidal patches.

A few words should be said in regard to the retinal pigment. The pigment epithelium is visible from the disc to the equator as a fine dark stippling. This stippling at many points is but little pronounced, although even over the large white foci it is still partially visible. Besides this, numerous spots of coal-black pigment are deposited at various points in the retina. Some of these possess the bone-corpuscle appearance of the pigment spots in retinitis pigmentosa, and these are more numerous in the nasal half of the fundus.

In the equatorial region the pigment is arranged in great clumps among the small round atrophic spots.

Taking the clinical picture as a whole we have here, first, changes found in moderate degrees of retinitis pigmentosa: pallor of the disc, narrowing of the vessels, and the irregular deposition of pigment in the retina indicating atrophy of the retina; second, a marked atrophy of the choroid exists, extending nearly to the periphery and otherwise leaving only the macular region free. Near the disc the choroidal atrophy appears in the form of large white areas beneath the retinal vessels. Farther from the disc the choroidal atrophy is recognizable in the lighter tint of the fundus and the clearness with which the choroidal vessels are seen. The peculiar changes in the vessels themselves, however, is the feature that particularly characterizes the clinical picture.

The question may now be discussed as to how the clinical picture developed. We can hardly go wrong in assuming that the affection was first localized near the disc, because the changes here are more marked. Then it may safely be assumed that the large white foci represent only a higher degree of atrophy and at first had the appearance now presented by the parts farther in the periphery. It is also scarcely to be doubted that this atrophy of the choroid was caused by the changes in the vessels and that the atrophy kept pace with the destruction of the vessels. Similarly, the sluggish pupillary reaction may have been due to an atrophic process in the iris proceeding from vascular changes.

It is also possible to diagnose with considerable certainty the pathological process affecting the vessels. If then we take into account the age of the patient, and remember that previously vision in the two eyes had been good, and that the affection has had a very chronic course without any inflammatory reaction, it seems highly probable that the changes which have taken place in the choroidal vessels are to be regarded as of a senile nature and the process as a vascular sclerosis. This sclerosis affected not only the arteries but also the veins of the choroid, although the changes in the latter are slight. We saw above that the

trunk of the vortex veins had a normal appearance, but that the branches entering it from behind were altered in part in the manner described. The localization and the development of the clinical picture are thus rendered comprehensible. Since the sclerosis affects first the larger arteries, and these enter the eye near the disc, the process must begin in this region and the more peripheric parts will be affected later and with less intensity.

The retinal atrophy is to be regarded as dependent upon the choroidal atrophy. The relatively slight atrophy of the former and the advanced atrophy of the latter render this very probable. Also the presence of a large portion of the pigment epithelium speaks for a primary affection of the choroid. One might suppose that the retina simultaneously with the uvea became atrophic through vascular changes. But no trace of sclerotic change is visible in the retinal arteries, and on the other hand a choroidal atrophy so well marked as this may well affect the retina in this way. We know that in typical retinitis pigmentosa the process develops in a similar manner. Therefore the dependence of the retinal degeneration upon the choroidal atrophy is very probable in our case.

This case is of the greatest interest because of the advanced and extensive sclerosis of the choroid, which is the more striking as the organism otherwise presents no marked evidences of vascular sclerosis. It is interesting also on account of the co-existence of atrophy of the retina and of the choroid, which has been seldom observed. Altogether five cases are on record, one reported by Jacobson in Zehender's *Monatsheften* in 1888, and four reported by Fuchs in *THESE ARCHIVES* (German edition, vols. xxx.-xxxii.) in 1896. Fuchs, who considers this a particular form of disease—*atrophia gyrata choroideæ et retinæ*,—noted its similarity to retinitis pigmentosa. He showed that in both, heredity and consanguinity of parents play a considerable rôle, that both begin in childhood with hemeralopia, and that only the existence of marked atrophy of the choroid distinguishes the affection from retinitis pigmentosa. But is our case identical with Fuchs's *atrophia gyrata*? This question must be answered

in the negative, for our case is distinguished from the others by its commencement and by the visible changes in the choroidal vessels. On the other hand, they have in common the great similarity of clinical symptoms, the course of the affection, and the dependence of the retinal degeneration upon a primary chronic affection of the choroid.



## ON A MYCOTIC AFFECTION OF THE CORNEA.

BY PROF. B. WICHERKIEWICZ, CRACOW.

*(With two figures in Plate XXIII. of Vol. XL., German Edition.)*

Translated by Dr. WARD A. HOLDEN.

**D**ISEASES of the cornea caused by microbes are seen frequently, and are treated often with good results, but fungi seem to affect the eye, and particularly the cornea, but rarely.

Up to the present time only a few cases have been reported. Therefore, I take the opportunity to report a case caused by a fungus different from that found in the other cases reported.

On June 18, 1889, a laboring woman of twenty-three was received in the clinic with the following history :

Three weeks before, while digging potatoes, she was struck in right eye by a bit of dirt. The eye became painful and a physician was consulted, who instilled something and ordered flaxseed poultices. The eye became worse and she came to the clinic.

When received, both lids were a little swollen, and the bulbar and palpebral conjunctiva markedly injected, but smooth. Numerous superficial dilated vessels passed to the limbus, which, greatly injected, formed a red ring, covering the sclero-corneal junction. (Fig. 1, Pl. XXIII.) From this ring finer radiating vessels passed in regular arrangement toward the middle of the cornea which was occupied by a tough, yellowish-white homogeneous mass. This mass was nearly round, having a diameter half that of the cornea, an irregular outline, and an elevated uneven surface. The vessels were most numerous below. But through the vessels one recognized a light background limited

above by a horizontal line, and below by the margin of the cornea. When the head was bent over, this horizontal marginal line seemed to change position.

The eye was not particularly painful or sensitive to the touch.

T N. V = p. l.

The neighboring tissues were not affected and the lachrymal apparatus was normal.

At first glance the condition seemed to be one of corneal ulcer with destruction of tissue and hypopyon, but the slow course, the mild reaction, and the peculiar appearance of the necrotic tissue which protruded above the surface of the cornea and was resistant when touched with the probe, excited my suspicion that the affection was possibly of mycotic nature.

Bits of the infiltrated masses therefore were removed and placed in bouillon and on agar.

Treatment was as follows: atropine twice daily, 10 % xeroform ointment once daily, boric-acid fomentations, and an occlusive bandage at night. No particular change followed several days' treatment.

The cultures were by accident destroyed, but being convinced of the mycotic nature of the affection an operation was resorted to twelve days after the patient's admission.

An effort was made to remove the mass with a sharp spoon, but it was so resistant and so tightly adherent to the cornea that the effort was unsuccessful. With a Graefe knife the superficial layers were removed, but it was not thought advisable to attempt to remove the deeper layers.

The operation was well borne, and the same treatment was continued and gradual improvement took place.

July 18th, the following notes were made :

The cornea has its normal curvature and is smooth except for a gray spot, as large as a pin-head, in the centre which is not covered with epithelium. This spot is surrounded by a broad ring of cornea covered with a fairly thick superficial vascular network; peripheral to this is a fairly regular gray circle almost concentric with the sclero-corneal junction and separated from the latter only by a dense network of superficial vessels. The vascular network covering the sclero-corneal junction is now narrower and paler, and the conjunctival injection is less. In place of the previously existing hypopyon is a gray area limited above by a convex line. (Fig 2, Pl. XXIII.)

The vision remained unimproved since the cornea was still almost entirely opaque. July 20th the patient was discharged and was not seen again.

Cultures from the mass removed at the operation gave rise to flat, dark-gray colonies and Prof. Bujwid, who kindly examined them, stated that the fungus belonged to the *penicillium glaucum* variety.

Microscopically one saw only a dense mass of threads with a few cells among them, and no trace of corneal tissue could be discovered.

As mentioned before, mycosis of the cornea is extremely rare if one may judge from the small number of cases reported, although it is not impossible that cases of this sort have sometimes been mistaken for hypopyon keratitis. Up to this time<sup>1</sup> only three cases have been reported, to my knowledge. Leber first called attention to the affection nearly twenty years ago.<sup>2</sup> Uhthoff<sup>3</sup> in 1882 carefully studied a case previously reported in a dissertation by Berliner.

Fuchs described a third case<sup>4</sup> and discussed the earlier cases fully, so that I shall say but a few words in regard to them here.

Leber's case due to the *aspergillus fumigatus* and Fuchs's case arose in some unknown way, but in my case the *penicillium glaucum* was transported to the eye through the medium of a bit of earth. In Uhthoff's case the eye was injured with a pear, and the variety of the fungus was not determined. Fuchs suggested that his patient, a miller, had possibly first suffered a loss of epithelium through herpes febrilis in which flour dust, containing the fungus, had lodged.

Thus, in three cases, the inoculation occurred from a body causing direct injury, and only in Fuchs's case was the mycotic affection probably secondary.

The clinical picture is so characteristic, that the affection

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<sup>1</sup> February, 1900.

<sup>2</sup> *Graefes Archiv*, xxv., 2, p. 285, 1879.

<sup>3</sup> *Graefes Archiv*, xxix., 3, p. 178.

<sup>4</sup> *Wiener klin. Wochenschr.*, 1894, No. 17.

will be recognized even if one has not previously seen a case. Although it may resemble that of hypopyon keratitis, it is distinguished by the unusually slow course and the slight subjective symptoms and the unimportant accompanying symptoms even when the corneal changes are pronounced. The uveal tract in particular exhibits little disposition to become involved.

The tissue resembling necrotic cornea is elevated above the normal level of the cornea, and is more resistant than the necrotic tissue of keratomalacia, and has a fairly sharp outline. My case would seem to indicate that the fungus grows as a saprophyte on the injured cornea but does not pass into the healthy portions of the cornea, otherwise the restoration of the form of the cornea would be impossible. However, Leber's inoculation experiments have shown that fungi may grow in the living rabbit's cornea, and it seems probable that in the three cases cited the fungi had entered the cornea and partially destroyed it. Whether perhaps the *pencilium glaucum* acts in a different manner from the *aspergillus* must still be determined by experiments on animals.

However, in my case there was no destruction of corneal tissue and the fungus carried to the injured spot developed here and spread over the surface of the cornea. The vessels developed by the irritation formed a wall preventing further extension and also protecting the underlying tissues.

What therapeutic measures are to be employed in a case of keratomycosis? The cases so far reported offer us little information in this respect.

Fuchs removed the diseased parts with forceps and scissors, chiefly, however, for more careful examination, and although this may have influenced the course of the disease favorably he did not neglect to employ the remedies usually employed.

In my case a radical operation might have hastened the recovery, but I refrained from attempting such an operation because the diseased parts were so intimately connected with the healthy cornea, and because I wished to observe the course of the disease, which was not threatening the eye or particularly annoying the patient.



The colonies, in fact, grew smaller, and the hypopyon cleared up under the use of xeroform, which has been of good service in microbic affections of the cornea. Whether other remedies would have been more efficacious is a question which must be decided by further observations.

# REVIEW OF SIXTY-NINE CASES OF RUPTURE OF THE CHOROID, COMPILED FROM THE RECORDS OF THE NEW YORK OPHTHALMIC AND AURAL INSTITUTE.

BY F. E. D'OENCH, M.D., NEW YORK.

THE cases upon which this report is based were taken from the records of the New York Ophthalmic and Aural Institute, and cover a space of thirty-three years, and were compiled from a total number of over 150,000 patients. The compilation was not undertaken with the object of entering into the discussion of the mechanism of rupture of the choroid, as that is a problem, the practical and theoretical side of which has been discussed at great length by Hughes, Franke, and others, but rather to note what inferences, if any, could be drawn from a large number of cases.

As might naturally be expected, the male sex suffered far more than the female sex, on account of its being much more frequently exposed to injuries, the ratio being fifty-three to sixteen, or more than three to one. The greatest number of accidents occurred in early life, between the ages of ten and forty. The following table shows the relative numbers arranged in decades :

Under 10.....	4
Between 10 and 20.....	23
“ 20 “ 30.....	18
“ 30 “ 40.....	15
“ 40 “ 50.....	3
“ 50 “ 60.....	0
“ 60 “ 70.....	1

In five cases the age was not mentioned.

As to the seat of the rupture, the statistics bear out the observation that it occurs most frequently to the temporal side of the disc, between it and the macula, corresponding to the impact of the force. In only twenty-five cases was the seat of the rupture mentioned, but in ten of them it took place between the optic nerve and the macula, or in 40 %. In two cases it was downwards and inwards, in two at the macula, in five downwards, in three downwards and outwards, in one upwards and inwards, in one there was a double rupture, one on the temporal, the other on the nasal side, and in one there were four horizontal ruptures, above and below the disc. In four cases multiple ruptures of the choroid were noted, in the others they were isolated, though in many the number is not stated. One eye was injured just about as frequently as the other, the right in twenty-three cases, the left in twenty-four; in the others no mention is made whether it was the right or the left.

**Numerous complications** attended the injury, *the most frequent being hemorrhages*, which were noted in eight cases. Sometimes the blood entered the vitreous, this being noted in three cases, while the floating opacities observed in three others probably had the same origin. Another complication was *atrophy of the optic nerve*, observed in seven cases, and extending to the uninjured eye in another. I do not doubt that this is a result which would be noted much more frequently if the patients could be kept under observation for a year or more, as naturally it would not take place immediately, but as they soon learn that nothing can be done for them they are soon lost sight of. Other complications were *iridodialysis*, observed four times; *detachment of the retina*, one case; *connective-tissue formation* in the retina, three cases; **traumatic cataract**, two cases.

The rupture is almost invariably due to a direct blow upon the eye, but in one case the injury was inflicted with a toy shovel upon the bone, just below the outer canthus.

The *sight which these injured eyes subsequently obtained varied considerably*, usually falling below  $\frac{20}{200}$ . Unfortunately the notes are defective in this respect, a record of

the sight being found in only twenty-five cases. Some showed distinct improvement, for instance from  $\frac{10}{200}$  to  $\frac{20}{40}$ , while two regained  $V = \frac{20}{20}$ . These cases are such unusual ones in this respect that I append the notes.

John D., aged eleven. Rupture of choroid R. The boy while playing was struck with a stone, making an incised wound beneath the lower lid. Crescentic rupture of choroid with hemorrhage between optic disc and macula. Visual field complete;  $R\ V = \frac{20}{40}$ , bad illumination. + T 2. Two days later: External wound healed; periost. orbit. Intense hyperæmia of retina with swelling in region of rupture which obscures the latter to a certain extent. R. E.  $\frac{20}{20}$  with good illumination. Two days later  $V = \frac{20}{20}$ ; eleven days after being first seen  $V = \frac{20}{20}$ .

The other case was that of a young man twenty-one years old, who was struck with a baseball bat six months before he presented himself at the dispensary. His sight was  $\frac{20}{20}$ . There was also paralysis of accommodation. Unfortunately there are no notes besides this.

In one case the patient was seen after seven years, when  $V = \frac{7}{200}$ ; another eight years later, whose sight had practically remained the same, having risen from  $\frac{20}{200}$  to  $\frac{30}{200}$ .

A third was seen after two years, when  $V = \frac{10}{200}$ , and a fourth after six months, when his vision was  $\frac{20}{40}$ .

The varying state of the visual acuteness, especially the frequency of its great reduction, calls attention to the fact that it is not only the choroid which is affected by the injury, but also other parts of the eye, and probably the retina most of all. We know that extensive changes may take place in the choroid without affecting the acuteness of vision, but even slight changes in the retina are of much importance in this respect. The retina is made up of transparent elements, and under ordinary conditions escapes observation, and it is therefore probable that an injury sufficiently great to rupture the choroid will produce changes in so delicate a structure, which, though invisible to the observer may cause most marked subjective disturbances. More severe blows may lead to subsequent changes which are readily apparent, such as atrophy of the nerve and marked pigmentation in the neighborhood of the rupture,

which may partly be due to organization of the escaped blood, partly to proliferation of the choroidal or retinal pigment.

In conclusion I would like to call attention to one feature of injuries of this kind, and that is their forensic aspect. The physician may be called upon to give his testimony as to what extent the eye was injured, and such testimony may be of the greatest importance in deciding the question of damages. A case from my own practice may illustrate this:

L. V., aged forty-five, was struck on the left eye with the fist six weeks ago.  $V = \frac{1}{200}$ ; with  $-1\frac{1}{1}$  ax  $75^\circ$  n  $\subset + \frac{1}{40}$  ax  $15^\circ$  t  $V = \frac{1}{100}$ . In the right  $V = \frac{1}{40} -$ ; with  $-\frac{1}{8}$  ax  $75^\circ$  n  $V = \frac{1}{30} -$ . A small rupture of the choroid passes directly through the region of the macula, close to the fovea centralis. Had the injury taken place at another part of the fundus, its smallness would in all probability have led to a much less marked disturbance of vision. The man did not sue his opponent, as far as I know, probably because he himself was to blame.



## A CASE OF LOCALIZED TUBERCULOSIS AT THE HEAD OF THE OPTIC NERVE; MICROSCOPIC EXAMINATION.

BY DR. ARNOLD KNAPP.

(*With one figure on Text-plate I.*)

C. L., a two-year-old negro child, had always enjoyed good health. The parents are apparently healthy; a grandmother died of phthisis and another child presented some tuberculous manifestations in the first years.

Four months ago it was noticed that the left eye diverged and the pupil of the eye appeared white.

On examination, October 8, 1901, the left eye is free from inflammatory signs. The iris is normal, the media are clear. The retina is totally detached and its blood-vessels are easily visible by oblique illumination. Tension is normal. The other eye is perfectly healthy. The child is bright and well nourished. Physical examination reveals no abnormality. The eye is enucleated on the probable diagnosis of glioma.

After hardening in formol the eyeball is divided in the antero-posterior diameter.

*Macroscopic examination:* The anterior segment of the eye is normal. The retina is totally detached and includes a central funnel-shaped cavity. The subretinal space is filled with an opaque gray coagulum. The apex of the detached retina is occupied by a solid circumscribed white tumor about 0.6 cm broad. This tumor anteriorly projects into what remains of the vitreous chamber, is bounded laterally by the retina and posteriorly extends into the optic nerve for about 0.1 cm in its outer half, where it also appears to invade the neighboring choroid.

*Microscopic examination:* The tumor is composed of diffuse granulation tissue with many giant cells and miliary tubercles and a central large area of necrosis. All the retinal structures in the





To illustrate Dr. Arnold Knapp's Case of Localized Tuberculosis at the Head of the Optic Nerve.



neighborhood of the disc are obliterated by the morbid process. Beyond, the retinal elements are hypertrophied and the growth extends farther in the nerve-fibre layer. On one side the choroid is infiltrated with this same tissue and immensely thickened. This infiltration ceases abruptly; the new tissue is of recent date and shows no signs of caseation. Two additional areas of infiltration are situated in the choroid more anteriorly; but no change is observed in the area anterior to the equator. At the optic nerve the growth has extended backward in the substance of the nerve with sharply defined outline. The neighboring part of the nerve is moderately inflamed, the normal markings are gone, the vessels dilated, and the nuclear elements increased. The optic-nerve sheath is completely filled up with cellular elements, small, round, and epithelioid in character, showing at the site nearest to the affected choroid a miliary grouping. Staining for tubercle bacilli was positive.

Shortly after, the child developed a swelling in one elbow, later the tuberculous condition became more general.

October 27, 1902, both elbows are involved; there is cough and hectic fever. No clinical manifestations of meningeal involvement.

From the histological examination it seems proper to assume that the ocular lesion began in the retina, as the morbid process is most advanced in the retina and neighboring part of vitreous body, while the changes in the choroid seem recent.

Localization of a tuberculous focus in the retina is extremely rare. Michel<sup>1</sup> says that tuberculous nodules are sometimes visible in the optic papilla, especially at the margin, as small yellowish round protuberances; the entire papilla may even appear as a yellowish red surface with white threads suspended from it and red nodules (like grapes) projecting into the vitreous. Dr. Bailey,<sup>2</sup> in 1882, published a case in a man of twenty-seven, where the ophthalmoscope revealed a grayish mass bulging forward to the disc, but separated apparently by a horizontal crease. The eye showed a detached retina; projecting from region of papilla was a mass the size of a pea with all the histological characters of tubercle.

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<sup>1</sup> Quoted by v. Herff: "On Tuberculosis of the Optic Nerve and Chiasm." *Inaug. Diss.* Würzburg. 1893. <sup>2</sup> Bailey. *Medical Times*, vol. ii., p. 747.

O'Sullivan and Story<sup>1</sup> published a case of tuberculosis of the retina which resembles our case in an earlier stage and where the diagnosis was made before removal of the eye. Their patient was a healthy young woman of twenty-one. Ophthalmoscopically, the right eye presented the appearance of an intense papillitis with the exception that the papilla was extremely white and presented an unusual swelling. On dividing the eye, a tumor was seen to protrude at the posterior part of the retina just around the entrance of the optic nerve. The retina was moderately detached. Microscopically the tumor was typically tuberculous. The optic nerve was unaffected.

As example of a subsequent stage of this process, the following case may be cited. Sattler<sup>2</sup> described a case with the same intraocular condition as above, associated with a tuberculous tumor in the orbit.

Exophthalmos was present; the disc and surrounding area were occupied by a white mass. At operation a cylindrical tumor was found surrounding the optic nerve. Microscopically the optic nerve was converted into a mass of tuberculous granulation tissue. The sheath was infiltrated with lymphoid cells. The papilla was swollen and contained many lymphoid cells and submiliary tubercles, which had invaded the neighboring retina and choroid. The rest of the eye was normal. The child subsequently died of tuberculous meningitis. The primary infection was supposed to have taken place from caseated bronchial lymph nodes.

On the other hand, the retina and optic nerve have become involved secondarily to tuberculosis of the uveal tract in a number of reported cases.<sup>3</sup>

Nearly all of the cases observed have occurred in young individuals, and principally in childhood.

The accompanying illustration was taken from a photograph, for which I am indebted to Dr. E. Harlow.

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<sup>1</sup> *Trans. Royal Acad. Medicine of Ireland*, vol. xvii., p. 451.

<sup>2</sup> *Graefe's Arch.*, xxiv., 3, p. 227.

<sup>3</sup> Bongartz: "On Distribution of Tuberculous Infection in the Eye." *Inaug. Diss.* Würzburg. 1891.

# A METHOD FOR THE PREVENTION OF SYMBLEPHARON AFTER BURNS OF THE CONJUNCTIVA.

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(*With two diagrams in text.*)

OUR methods of treatment in conjunctival burns do not, as a rule, yield satisfactory results. Any means, therefore, which are apt to prove of benefit in this class of cases are well worth reporting.

J. M., a laborer, came to me in September of this year, suffering from a severe lime burn of the conjunctiva of the left eye, which had occurred about thirty hours before.

At the time he presented himself the lids were red and greatly swollen, there was a profuse muco-purulent discharge from the eye, the cornea was hazy, the iris minutely contracted, the conjunctiva intensely red and chemotic. The burned area involved the conjunctiva of the lower lid, the cul-de-sac, the lower portion of the bulbar conjunctiva, and a small portion of the lower part of the cornea, extending upward from the limbus about 2 mm.

The breadth of the burn was least in its upper portion, greatest in its lowest, forming, roughly speaking, a funnel whose point rested on the lower part of the cornea, whose base was formed by the lower part of the bulbar conjunctiva, the cul-de-sac, and the lower part of the palpebral conjunctiva.

This area did not form one continuous mass, but seemed rather to consist of coalescing points.

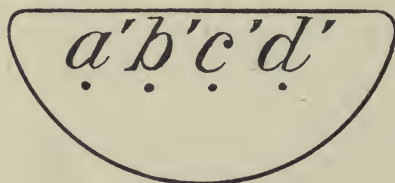
Sloughing had already begun, and those parts which had been burned stood out as grayish-white islands, surrounded by red, velvet-like conjunctiva. That part of the cornea involved in the burn was white and lustreless, the rest of the cornea hazy. Vision,  $\frac{20}{200}$ .



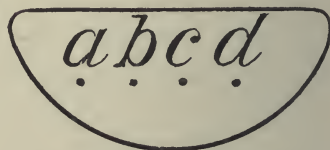
The only other case of extensive burn of the conjunctiva which I had had under my care was that of a simple-minded girl, who had attempted to boil rice in a tightly closed vessel, and both of whose eyes had been severely burned by the resulting explosion. In that case, the attempt had been made to prevent adhesions between lid and eyeball, by the frequent instillation of vaseline and the forcible separation of the lids from the eyeball every two hours night and day. The result was eminently unsatisfactory.

I therefore determined to pursue other methods in this case, and the following was the device employed.

A lead plate, a little less than 1 *mm* in thickness, was cut out so as to fit accurately between the lower lid and the eyeball, being adjusted firmly into the lower cul-de-sac, so as to put it on the stretch. Over this plate on the anterior or skin surface of the lid a somewhat larger plate was fitted. Each plate was perforated by four holes.



Outline tracing of outer plate.



Outline tracing of inner plate.

From within outward, through the holes in the plates, passing throughout the thickness of the lid, two double-armed sutures were passed.

One needle of the first suture was passed through the hole of the inner plate at *a* through the thickness of the lid and emerged at *a'*, the other needle passed in at *b* and out at *b'*, the two ends at *a'* and *b'* were tied moderately tight, so as to hold the plates firmly, but not to exert too much pressure on the lid.

The ends of the sutures were not cut, but left hanging; in the same manner the two needles of the other suture entered, one at *c*, the other at *d*, emerging respectively at *c'* and *d'*; the ends were firmly tied and also left hanging.

I then had the lid sandwiched in between two plates, which were held in place by means of two sutures passing through holes

in the plate and through the whole thickness of the lids, with the four ends of the two sutures hanging down over the cheek. Each end was then fastened to a strip of one-inch gauze. These strips, in pairs of two each, were passed down under the chin, the inner one to the left the outer one to the right, being drawn aside so as to avoid the mouth as much as possible, then turned backward, made to encircle the neck firmly several times, and tied over the nape of the neck; to avoid the mouth, however, the inner strip of each pair had to pass over the nose; the act of chewing, too, tended to dislodge the strips somewhat, so, after the first day, that method was abandoned and the following employed, which worked admirably: the length of each strip was increased to about three yards; each strip was then passed directly downward under the chin, turned to the right (the injured eye being the left one), passed completely under the chin, then up over the top of the head passing behind the ear, then down again under the chin, and so made to encircle the chin and the top of the head five or six times. The bandages were fastened in the desired positions by safety pins; the bandages having been starched and adjusted while damp, when they became dry had absolutely no give to them. The patient could open the mouth but very little, and so while the bandage was in place had to subsist mainly on fluids, which he drank through a tube.

By this method any desired amount of tension could be put on the lower lid, and I found no difficulty whatever in completely everting the lid, keeping it everted, and at the same time exercising a constant and considerable degree of tension.

The lower lid was kept in this position for eleven days; at the end of the third day a stitch abscess developed about one of the sutures; this was easily remedied by changing the place of the suture; at the end of the seventh day I again changed the suture, in order that I might crowd the inner plate deeper into the cul-de-sac and cauterize granulations behind it.

The next time I have occasion to use this device, I shall change the shape of the inner plate; instead of having the plate flat, I shall have the lower edge of the plate made much thicker than the rest, with the edges, of course, rounded; the plate can then taper off toward the upper edge, forming a wedge or prism-shaped body of which the lower edge forms the base; this kind of a plate can be

crowded into the cul-de-sac, so as to press out the folds completely, and that without causing the patient pain.

We must not forget that the lower cul-de-sac is not a simple bag of mucous membrane, but consists of a number of diverticula or folds, and I consider it one of the essential features necessary to treat this class of cases with any measure of success, to prevent adhesions between the sides of these diverticula and subsequent obliteration of the folds, by keeping them well pressed out and on the stretch, and then, when the inevitable subsequent shrinkage of the conjunctiva occurs, instead of having the bulbar conjunctiva drawn in bands, toward the lid, the conjunctiva of these folds may furnish enough mucous membrane, so that even if considerable shrinkage does occur, this disagreeable contingency may be obviated.

There is, of course, no danger to the cornea in keeping the lower lid everted for such a length of time, as it is protected by the upper lid. I, however, constantly kept a moist gauze pad over the eye, and found that by this means the spasmodic tendency of the lower lid to close was much diminished.

At the end of the fifth day small granulations were springing up freely over the burned area. After cocainizing the eye I carefully cauterized them with the nitrate-of-silver stick; this also was repeated on the seventh and ninth days.

The burn on the cornea gave no particular trouble, and at the end of four or five days was covered with epithelium.

At the end of eleven days the plates were removed; at no place did any bands of adhesion form between lid and eyeball, and while at the present time (almost two months after the accident) the fornix may be somewhat diminished in depth, due to subsequent shrinkage of the injured area, a distinct cul-de-sac still remains, and with the exception of the damage done to the cornea (vision  $\frac{20}{80}$ ) there has been no impairment of the function of the eye. Of course, a merely mechanical device can only accomplish mechanical results. The plates, by their interposition, can prevent direct adhesions between lids and eyeball, by the tension exerted

the healing surfaces can be put and kept on the stretch and shrinkage diminished, the folds of the cul-de-sac can be crowded apart and saved from obliteration, affording free mucous membrane when shrinkage occurs, and lessening liability to formation of bands between lid and eyeball.

When extensive areas of conjunctiva have been destroyed, subsequent contraction will inevitably follow; this is especially disagreeable where palpebral conjunctiva has suffered, for the conjunctiva not being movable over the lid, when contraction occurs the conjunctiva of the eyeball is drawn in bands toward the lid, causing all the disagreeable disturbances of direct adhesion between lid and eyeball. These are the contingencies which we strive our utmost to avert and lessen.

Any one who has watched the granulations spring up over such an injured area, and the great tendency for the different islands of granulations to unite and coalesce, will recognize the value of careful and thorough cauterization, and frequently one will see after touching a small granulating area with the stick how it will shrivel up, and how in a day or two the mucous membrane has crept in and covered a place where otherwise bands of connective tissue would have formed.

Of course the interposition of a foreign body to prevent symblepharon in burns or injuries of the conjunctiva where opposing surfaces are denuded is almost as old as ophthalmology itself.

A rag smeared in salve or oil, rubber plates, wax plates, glass plates, lead plates—all have been advised.

The device here described, however, has the great advantage not only of interposing a foreign body, but of completely separating the wounded areas and keeping them stretched apart under constant tension while healing is taking place, and, equally important, of crowding apart the folds of the cul-de-sac and preventing their obliteration.

Fuchs, in his text-book (seventh edition, p. 130), says a symblepharon must of necessity result where the denuded surfaces extend into the fornix, and are continuous with one another, for where you have raw surfaces meeting at an



angle, adhesion starts at the angle and draws the surfaces together.

Czermak (*Die augenärztlichen Operationen*) emphasizes the same idea, and states as the objection to the interposition of a plate, the fact that it is forced up by healing from below, and by the contraction when the opposing surfaces of the fornix unite.

These objections, however, are obviated where the opposing surfaces are not only separated from each other by a plate, but are drawn apart and kept drawn apart under constant tension till the surfaces are covered; furthermore, I think the starting-point of adhesion and contraction is not so much at the angle of the cul-de-sac as between the walls of the diverticula.

Thus far I have had no opportunity to employ this device after a plastic operation, where we wish to keep the lid separated from the bulbus under tension; here, too, however, it seems to me, the method should yield good results.



# REPORT OF THE MEETING OF THE GERMAN OPHTHALMOLOGICAL SOCIETY AT HEIDEL- BERG, AUGUST 4-6, 1902.

BY PROF. RICHARD GREEFF, BERLIN.

Translated by Dr. WARD A. HOLDEN.

FIRST SESSION, MORNING, AUGUST 4TH, DR. DOR (LYON)  
PRESIDING.

## I. ROEMER (Würzburg). Further investigations on the serum therapy of corneal ulcers.

Roemer has looked up the statistics of some of the benevolent societies in regard to injuries of the eyes. These statistics show the great social importance of serpent ulcer, which comprised more than half of the eye injuries reported as accidents.

Year	Number of eye injuries passed on	of which were serpent ulcers	%
1889	3	—	—
1890	7	2	28.5
1891	16	3	18.7
1892	11	2	18.1
1893	12	7	58.3
1894	17	12	70.5
1895	29	11	37.9
1896	29	11	37.9
1897	38	24	63.1
1898	60	29	48.3
1899	45	30	66.6
1900	50	26	52
1901	55	33	60

Since the passage of the accident insurance laws many millions of marks have been paid out in Germany because of serpent ulcers. If this infectious disease is adapted for a specific prophy-

laxis and serum therapy, it must be a specific infection. The author confirms the results of the investigations of Uhthoff and Axenfeld. In the past year he has examined by means of cultures 80 cases of serpent ulcer and has found the Fraenkel diplococcus in 95 %. The second condition in regard to the possibility of serum therapy is the fact proved by Roemer that the eye takes part in general immunity. Now with the discovery of antitoxin in the anterior chamber he has completed his investigations and reports in conclusion his clinical experience with the pneumococcus serum in eight cases of incipient serpent ulcer. All the cases were checked and recovery ensued. From these observations on men Roemer abstains from drawing conclusions as to the curative value of serum therapy. He believes, however, that he is justified in expressing the hope that the antitoxin may serve as a specific prophylactic by rendering the organism immune and thus preventing the development of serpent ulcer if used early.

*Discussion.*—Axenfeld recommended the prophylactic extirpation of the diseased lachrymal sac.

2. RAEHLMANN (Munich). **On trachomatous affections of the lid margin and tarsus.**

While all the other inflammatory affections of the conjunctiva practically never involve the tarsus, in trachoma this involvement is so frequent and regular as to render it probable *a priori* that the tarsus actually takes an individual part in the disease. Clinically this participation of the tarsus is recognizable through a change in the secretion of the glands imbedded in it. The secretion of the Meibomian glands, which in normal conditions is clear and transparent and scarcely recognizable, is poured out in considerable quantity as soon as follicles lie on the tarsus and conjunctiva; it becomes cloudy and, when the follicles are numerous on the tarsus and particularly when they have ulcerated, it contains crumbling masses and small hard concretions and is of a foamy character. Sometimes the altered secretion appears, when the lid margin is compressed, like the curved stringy secretion which is expressed from a comedo. This secretion covers the lid margin in pronounced cases, and, if there is entropium, finds its way into the conjunctival sac and lies in masses in the retro-tarsal folds. The ducts of the glands where they open on the lid margin appear normally as fine points, but in trachoma they become larger and more prominent.

When numerous follicles are in a state of ulceration or cicatri-

zation, the posterior portion of the lid margin becomes roughened and even the anterior portion may become similarly changed. The tissue about the roots of the lashes is swollen and the hair follicles become wider, exposing the roots. The secretion of the sebaceous glands becomes more liquid. When this form of blepharitis is well-marked, the tarsus-conjunctiva is mostly already cicatricial and thickened in its upper two-thirds. In the lower third there are then generally found many follicles just above the margin of the lid. In some severe cases the follicles may extend over to the lid margin and breaking down give rise to ulcers. At the time when the thickening of the lid margin is pronounced, the tarsus may already be softened or diminished in size by atrophy. The consecutive progressive atrophy of the tarsus which has been thickened is often found following soft degeneration of the conjunctiva. In rare cases, however, the tarsus may become enormously thickened from amyloid or hyaline degeneration.

The relation of the affection of the Meibomian glands and the lid margin to the various phases of the disease of the conjunctiva are quite well shown in the following table.

EXAMINATION OF 657 TRACHOMATOUS EYELIDS.

	Location of the follicles in the			Scars	
	fornix	tarsal conjunctiva	fornix and tarsus. Ulceration soft infiltration	Small scars of tarsal conjunctiva	Deep flat scars. Scars of tarsal conjunctiva
Number of lids examined.....	60	61	25	260	251
Lid margin: swollen, irregular, etc.....	7%	12%	44%	38%	91%
Anterior angle and region of lashes: thickened and irregular.....	3"	8"	48"	40"	91"
Intermarginal space: hyperæmic, rough, cleft, etc.....	0"	0"	0"	2"	70"
Intermarginal space: covered with foamv secretion.. ....	12"	44"	52"	31"	53"
Meibomian glands: ducts altered, secretion abnormal...	8"	28"	56"	55"	85"
Posterior angle: thickened, cleft, etc.....	5"	11"	20"	24"	43"
Follicles on posterior portion of lid margin.....	0"	6"	6"	4"	8"
Trichiasis.....	0"	0"	8"	7"	25"
Madarosis.....	0"	0"	0"	7"	27"
Tarsus thickened.....	0"	0"	6"	32"	84"
" softened.....	1"	3"	31"	18"	34"
" curved.....	0"	0"	10"	5"	50"
" shrunken.....	0"	0"	0"	0"	34"

The same results in regard to the proportional participation of the lid margin and tarsus in trachoma are shown also by microscopic examination. Thus even in the beginning the disease is not limited to the palpebral conjunctiva, as is generally believed, but passes regularly to the submucous tissue—that is, when the follicles are grouped together the small-celled infiltration of the region regularly passes into the depth of the tarsus and extends the more deeply the more follicles there are present, often down to the acini of the Meibomian glands. A point of predilection for the small-celled invasion is about the middle of the tarsus, where its large vessels communicate with those of the conjunctiva. Among these vessels the round cells are mostly grouped into nests and form at times globular masses of follicle-like structure. In more advanced cases of severe trachoma, when the follicles in the tarsal conjunctiva are thrown off and fresh scars appear, one finds in the interior of the tarsus, frequently, typical follicles of different sizes. They mostly break down and cicatrize, thus destroying the acini of the Meibomian glands over a considerable area. With the further progress of the conjunctival processes there is diffuse infiltration of the tarsus with round cells and often follicle formation. At times these follicles break through into the interior of the Meibomian glands; in rare cases there may be in the lower lid a perforation of the outer skin by the infiltrated tissue. Frequently the upper portions of the acini are cut off by the follicular process from the lower. The acini thus cut off become cystic with various sorts of contents, or still communicating with the main ducts their contents pass to the lid margin or the conjunctival sac.

In some cases the cystoid cavities lack any epithelial lining and are apparently empty. When the glands are already destroyed in the upper portion of the tarsus, remains of them may be found at the lid margin.

When the changes in the lid margin and tarsus are so far advanced, the dense conjunctival scar, as a rule, has already caused a considerable curving of the tarsus. This termination in entropium is the most frequent one in the course of trachoma, but not the only one. Frequently, in severe trachoma, notwithstanding the intense involvement of the tarsus, the entropium does not develop. The tarsus atrophies, the Meibomian glands disappear, and still the lid retains its normal position, and there is no entropium. In such cases the tarsitis accompanying the con-



conjunctival affection causes a shrinking of the tarsal tissue synchronously and proportionately with the conjunctival cicatrization. The severer forms of tarsitis with soft infiltration of the conjunctiva lead in the end rather to atrophy and diminution of the tissues of the lid than to entropium. The greatest curving of the tarsus occurs when the middle of its surface is invaded by the follicular process and softened. When in sagittal sections of trachomatous lids a marked bending of the tarsus is found, at the angle either typical follicles as foci of softening are present, or, in their place, the dense scars they have left behind them.

With atrophy of the tissue of the tarsus there are usually also atrophic changes in the conjunctival scar. The same processes take place in both. In both one finds sclerotic, thickened fibrous tissue, the bundles running mostly in a sagittal direction, with many spindle cells among them.

In the end stages of severe trachoma there is found later, in place of the formerly cicatricial sclerotic connective tissue, a fine reticular tissue with large elongated cells at the nodal points. In such cases the scar tissue in the tarsus and conjunctiva has undergone a fatty metamorphosis and broken down leaving only the fine reticulum. The latter manifestations of the trachomatous process are found in the tissue of the lid margin when the conjunctival affection has almost run its course. Here, when the conjunctiva is wholly cicatricial and the tarsus shrunken, one frequently finds still typical follicles in the lowest parts of the tarsus-conjunctiva close above the inner angle of the lid margin. Sometimes one finds follicles in the tissue of the lid margin also, within the greatly infiltrated margin.

Moll's glands in the lid margin undergo changes similar to those in the Meibomian glands, becoming distended and filled with altered secretion. A peculiar change is found in the accessory lachrymal glands after trachoma has run its course. They are often greatly developed and sunken lower down toward the margin of the lid in cases in which the Meibomian glands are completely atrophied. This hypertrophy is perhaps for the purpose of compensating for the diminution of the normal secreting surface caused by trachoma.

Judging from the size relations of these glands one must conclude that the conjunctiva can well be kept moistened by them even after all the other secretory organs are atrophic. This explains the well-known but surprising fact that xerotic drying of



the conjunctiva does not always correspond to the changes in the conjunctiva in trachoma, but that it appears early in some cases while the conjunctiva is not yet cicatricial, and in other cases is wanting notwithstanding complete cicatrization of the conjunctiva. It is worth while in cases of xerosis of the conjunctiva to take into account the condition of these glands.

The foregoing represents the course of the affection of the tarsus and lid margin as seen in severe cases of trachoma.

3. BACH (Marburg). **The centres of pupillary reaction.**

Bach reports on experiments carried out jointly with Hans Meyer on cats that had been tracheotomized and on which artificial respiration was performed. The chief purpose was to find what influence a division of the cervical cord and medulla has upon the light reaction of the pupil.

The results may be stated briefly as follows. Section of the cervical cord has no effect upon the light reaction of the pupil. Section at a particular spot near the spinal end of the floor of the fourth ventricle, immediately cuts off the light reaction. Unilateral section at this point causes reflex iridoplegia of the opposite side. Mild mechanical or other excitation at this point caused myosis and reflex iridoplegia. This myosis and reflex iridoplegia can at once be relieved by section above the spinal end of the floor of the fourth ventricle and reaction then becomes prompt.

The results of the experiments are best explained by supposing a regulating influence on the pupil by the spinal end of the floor of the fourth ventricle, in the sense of a reflex-inhibitory centre.

Injections of nicotine into the orbit of the cat causes paralysis of the sphincter pupillæ in a few seconds, and of the sphincter in the other eye a few seconds later. This indicates the presence of sympathetic nerve cells in the orbit, and speaks in favor of the sympathetic nature of the ciliary ganglion without denying the possibility of its being of mixed nature.

Investigations in regard to the oculomotor nucleus in men who had lost one eye, or in whom one eye had been phthisical for years, failed to confirm Bernheimer's findings with reference to the Edinger-Westphal nucleus after evisceration of the eyeball, and his views of the physiological function of this nucleus.

4. PETERS (Rostock). **On changes in the epithelium of the ciliary body in naphthalin and ergotin poisoning.**

The author reports on experiments for the further study of the

ciliary epithelium in various forms of artificial cataract. After a single administration of naphthalin, vesicles were found in the region of the pigment epithelium of the ciliary processes as well as in the retina, such as are found after puncture of the anterior chamber. The pigment epithelium is in part destroyed and thrown up into vesicles. The cuboidal epithelium exhibits numerous vacuoles, and on the surface of the ciliary processes there is a deposition of albuminous secretion. Thus, anatomically, one finds an increase in the normal secretion and the appearance of an abnormal secretion when the cataractous changes consist only in slight plaiting of the capsule at the equator of the lens.

After ligation of the *venæ vorticosæ*, the conspicuous symptom is the excessive hemorrhage, but very early changes in the ciliary epithelium similar to those described may be found, while the chief cause of the fibrinous exudation is to be sought in a directly mechanical lesion of the tissue from the excessive hemorrhage.

Furthermore, the author experimented with ergotin in the attempt to produce cataract. Although the early death of the animal prevented the observation of the development of cataract, yet after the subcutaneous use of ergotin characteristic changes were found in the ciliary epithelium, so that one may assume that this poison has a rapid and specific effect upon the ciliary epithelium, and that the latter under this influence secretes an aqueous humor in which the relative amounts of normal components are altered—the action of which upon the lens has been described in detail in an earlier paper.

*Discussion.*—VOSSIUS spoke of cataract in young women with struma. This is a sort of nuclear cataract and Vossius believes that it also is dependent upon toxic influences.

SCHMIDT-RIMPLER had observed an ergotin epidemic in Marburg. He believed that such forms of cataract were rather caused by general spasms.

UHTHOFF, PFLUEGER, and SATTLER denied any connection between struma and cataract.

5. ELSCHNIG (Vienna). **On histological artefacts of the optic nerve.**

Siegrist, at the previous Heidelberg meeting, reported on a new degeneration of the optic nerve designated “degeneration in patches.” Fuchs and Wagenmann stated in the discussion that they regarded these as post-mortem changes or the effects

of hardening. Elschnig has long recognized these changes as the results of compression and recently, together with Dr. Goldberg, he had proven experimentally that the changes were such in fact. By compression, in chiselling the nerve from the optic foramen, or in severing the nerve with scissors, particular bundles of the optic nerve were emptied of their contents and the soft nerve masses were forced into adjacent parts of the nerve, escaping from the bundles and perhaps passing through septa into neighboring bundles whereby all the manifold changes described by Siegrist were produced.

6. E. VON HIPPEL (Heidelberg). **On the origin of typical congenital coloboma of the eyeball.**

A male rabbit with coloboma at the optic-nerve entrance transmitted the malformation to 20 % of his progeny. The fœtuses were examined, in all 112 ocular vesicles presenting 23 colobomas.

Ætiologically one could exclude: 1. An inflammatory process. 2. An injury of the cells of the ocular vesicle from toxins of any sort. 3. The effect of pressure of the amnion. 4. A primary developmental anomaly of the brain. The only authenticated ætiological factor was the hereditary on the male side. The question whether a coloboma is to exist is determined when the spermatozoön unites with the ovum. Coloboma is purely a checked development.

*Discussion.*—WAGENMANN knew a woman with coloboma whose children all had coloboma although they were the offspring of three fathers.

BAHN also presented the history of a family with coloboma.

7. WAGENMANN (Jena). **On anæsthesia by chloride of æthel.**

Wagenmann obtained anæsthesia for small operations about the eye, particularly in the region of the lids, brows, and tear sac, by freezing with æthel chloride, while the ball was protected with a guttapercha plate and a pledget of gauze over the palpebral aperture. Experiments on rabbits had shown that æthel chloride did no harm even when it entered the conjunctival sac, but freezing of the surface of the eye must under all circumstances be prevented. It is sprayed on through a particular nozzle (Hertel), and no bad effects have been observed from its use in a great number of cases. If pain is felt in the depth of the wound, cocaine is dropped in.



*Discussion.*—SCHMIDT-RIMPLER stated that the deeper parts do not lose their sensibility.

FRANKE and AUGSTEIN prefer to use the Schleich solution.

8. PFLUEGER (Berne). **General narcosis in the Berne eye clinic.**

Pflueger has given up ether and uses chloroform for narcosis. He had had an apparatus constructed which properly mixed chloroform and air and reduced the use of chloroform to a minimum.

NIEDEN recommended for general narcosis subcutaneous injections of scopolamin such as are now used in the Bonn surgical clinic.

9. FUCHS (Vienna). **Scleritis posterior.**

In a boy of sixteen, pain appeared first in the right and two months later in the left eye and soon after disturbance of vision. In the fundus there was, besides hyperæmia of the disc, a steel-gray opacity of the retina in the macular region, with protrusion forward of the retina, recognizable by the fact that the refraction here was hyperopic. The conjunctiva and the episcleral tissue were reddened and swollen near the outer canthus. The opacity of the retina and the disturbance of vision disappeared in a week. The opacity and protrusion of the retina could not be referred to an inflammation of this membrane or of the choroid because of the relatively slight disturbance of vision and their rapid disappearance without leaving permanent changes. The pain would indicate an inflammation of the sclera. Fuchs assumed the existence of a scleritic focus in the posterior part of the sclera with opacity and swelling of the overlying choroid and retina.

*Discussion.*—SCHLÖSSER reported a similar case which had become clear to him since hearing Fuchs's paper.

10. STOCK (Freiburg i. Br.). **Experimental contributions to the localization of endogenous injuries of the eye.**

Stock, unlike Gasparrini, Bellarminoff, and others, had been unable, by injecting the toxins of the diphtheria bacillus, the staph. pyog. aureus, and the bacterium coli into the vitreous of one eye, to cause an inflammation in the other.

After injecting cultures of pyocyanus  $\beta$  into the ear veins of rabbits, however, he frequently obtained inflammation of the eyes. The metastases appeared exclusively as bacterial emboli on the anterior surface of the iris (nodular iritis). In one animal an extensive choroiditis was observed.

The author comes to the following conclusions :

1. In general blood infection in rabbits, metastases frequently appear in the iris. Their frequency increases with the severity of the infection.
2. This nodular iritis may be recovered from.
3. The author is unable to say definitely whether the irritation has any influence upon the formation of metastases.

Of thirteen animals into whose blood current tubercle bacilli were introduced, thirteen times an iritis tuberculosa and choroiditis disseminata appeared, one animal recovering,—a definite proof that a tuberculous iritis and choroiditis may be recovered from.

*Discussion.*—UHTHOFF had seen a large choroidal tubercle disappear. He also regarded tuberculous meningitis as curable.

RÖMER called attention to the susceptibility of the eye to metastases. He believed that the development of sympathetic ophthalmia could best be explained in this way.

AXENFELD remarked that Stock obtained experimental metastases so often because he made intravenous injections. This occurred much less frequently when subcutaneous injections were employed.

SECOND SESSION, AUGUST 4TH. DR. SCHIRMER (GREIFSWALD)  
PRESIDING.

*Demonstrations.*—RÖMER, RAEHLMANN, ELSCHNIG, and v. HIPPEL demonstrated preparations illustrating their papers.

1. AXENFELD (Freiburg). *a. On the pathological anatomy of fracture of the orbit.*

At the autopsy on a man of sixty who had suffered a severe blow many years before there was found protruding toward the brain through a perforation in the roof of the orbit as large as a quarter, a mass which proved to be a hernia orbito-cerebralis following a perforating fracture of the roof of the orbit and rupture of the dura. It was covered by an organized dural hematoma. The fact that the brain did not protrude into the orbit, as would naturally be expected, was probably due to the fact that hemorrhage into the orbit increased the tension here beyond the intracranial tension and later the organized hematoma prevented the prolapse of brain tissue. (A more detailed account may be found in v. Schuster's *Inaug. Dissert.*)

*b. On the new formation of glassy membranes in the eye (vitrification of the iris).*



In an eye with absolute glaucoma there was found microscopically a very peculiar configuration of the iris, caused by the fact that the entire iris on both anterior and posterior surfaces back to the ciliary body was covered with a vitreous membrane resembling Descemet's membrane, which appeared to compress the iris tissue greatly. The thicker pupillary portion with the sphincter together with the thinner remainder of the iris had, in sections, the form of a drumstick. Low degrees of this vitrification of the iris proceeding from the endothelium of the chamber angle are not rare in glaucoma (Wagenmann, Michel).

**c. Fibrin-like masses in a luxated calcareous cataract.**

**2. WAGENMANN (Jena). On the pathological anatomy of rupture of the choroid and iridodialysis.**

Only the inner layers of the choroid were torn ; the rupture of the choroid began at the point where a ciliary artery passed in. In the course of the entire rupture the edges were united by a delicate cicatricial tissue. The iridodialysis corresponded to a rupture of the zonula, and the equator of the lens was here more convex. From the scar in the iris a layer of endothelium passed to the lens, resting on the vitreous, which protruded through the rupture in the zonula.

**3. UHTHOFF (Breslau). Microscopical preparations of diphtheria of the human conjunctiva.**

**4. THIER (Aix). Demonstration of an orbital tumor.**  
Large osteoma in a girl of twenty.

**5. DIMMER (Graz). Demonstration of photogrammes of the fundus.**

Dimmer has now obtained much better results than he showed at the meeting in 1901. By improving his apparatus he has succeeded in taking actual instantaneous photographs. The pictures are 30 mm in diameter, but will stand a double or triple enlargement. As in the earlier photographs, a fundus field of 5-6 p. d. is obtained, but now it is sharper in detail. The perfected apparatus is now being made by Zeiss, and it will be so constructed that it may be used even by one who has not a special knowledge of its principles.

**6. HEINE (Breslau). Demonstration of stereoscopic photogrammes.**

**7. GULLSTRAND (Upsala). Demonstration of an instrument for completing the ray formations about luminous points.**

8. PFLUEGER (Berne). **Demonstration of a protected Stilling harpoon for the purpose of operating in the anterior chamber without the escape of the aqueous humor.**

*Discussion.*—LEVINSOHN (Berlin) recommended a sort of de Wecker scissors with which one could work in the anterior chamber without the escape of aqueous.

9. STOEWER (Witten). **An instrument for extracting the lens in its capsule.**

The instrument consists of a spoon which is laid over the anterior surface of the lens. The neck of the spoon is hollow and continuous with the cavity of the bowl. At its free end a rubber balloon is fastened. After making a large corneal flap and a broad iridectomy, the balloon is compressed and the bowl of the spoon passed over the anterior surface of the lens. The balloon is then released and the suction holds the lens fast in the spoon and it is drawn forward into the anterior chamber. The few experiments yet made naturally allow no definite conclusions as to the practical value of the instrument.

10. V. PFLUGK (Dresden). **A phantom for ophthalmoscopic practice.**

Two eyes are fastened upon a stative similar to the black phantoms used for operations. By a simple mechanism exophthalmus and enophthalmus can be produced. The cornea has a curvature of 8 mm radius. The pupil can be altered from 2–10 mm by introducing different diaphragms. The lens has a refractive power of 66 D. The distance from the posterior pole of the lens to the location of the retinal image is 15 mm. The curved fundus, colored in its normal colors, rests in a sliding cylinder with a scale which indicates the refractive condition in dioptries. The phantom is adapted for the direct and indirect methods of examination, and for skiascopy.

Manufactured by P. Doerfel, Berlin, N. W. T., Unter den Linden 44. Price 65 marks.

11. HERZOG (Berlin). **On the development of the intrinsic muscles of the eye.**

The author states that the sphincter and dilator pupillæ are of epithelial origin, while the ciliary muscle arises from the mesoderm. Numerous preparations were demonstrated.

THIRD SESSION, AUGUST 5TH, MORNING. DR. GULLSTRAND  
(UPSALA) PRESIDING.

1. VOLKMANN (Berlin). **Conclusions as to practice from the theory of eye magnets.**

The author distinguishes attraction and traction magnets. For the former the weight of the splinter of iron is of no importance, but its form is of great importance. These strong magnets must be used with great care.

With the traction or sound magnets the form of the splinter is of little importance, but its diameter is of great importance.

*Discussion.*—HAAB, in the course of ten years, had used his giant magnet on about 170 cases. Among 165 of which records had been kept the extraction was accomplished in 141 cases, or 86 %. He now almost never uses the small magnet. In 51 cases good vision was obtained.

SCHREIBER (Magdeburg) was the first to use Volkmann's magnet in practice; in four cases with excellent results.

2. FRANKE (Hamburg). **On the diagnosis and treatment of retrobulbar diseases.**

Franke demonstrated five skiagraphs of retrobulbar tumors, and discussed the indications for Krönlein's operation.

*Discussion.*—SCHMIDT-RIMPLER recommended his sound method for diagnosing retrobulbar tumors.

3. KRÜCKMANN (Leipsic). **Iridocyclitis syphilitica.**

The syphilitic changes run in the eye a course clinically analogous to those of the skin and mucous membranes.

Krückmann divides the secondary stage in the iris and ciliary body into the erythematous, the papular, and the tuberos. He describes fibrinous iritis as a roseola, and classes it with the primary erythematous angina. He distinguishes early and late forms of papules, and shows on anatomical grounds why these efflorescences always present themselves in the pupillary region and have a round shape. The signs of tuberos syphilides, which distinguish them from gummata, are discussed. The histological changes are discussed, and he concludes with a detailed clinical description of the various sorts of gumma.

4. AXENFELD and NAÏTO. **Nerve loops in the sclera.**

Axenfeld described at the Heidelberg Congress, in 1893, a nerve that passes transversely through the sclera close behind the ciliary body. It had twice the thickness of an ordinary



ciliary nerve, and divided in the suprachoroidal space into an anterior and a smaller recurrent portion.

The study of serial sections has shown the writers that such nerves are ciliary nerves, which pass through the sclera, run on its outer surface, and then pass back through the sclera and give off branches, some of which run to the ciliary body. There nerves are found frequently, but not constantly. As a rule, only one nerve of this sort is found in the eye. The development and physiological significance of this loop are hard to understand. Such a nerve gives one the impression of being too long for the eye, and the loop would seem to be a means of fixation which allowed a lateral distribution farther forward.

5. SCHIRMER (Greifswald). **On lachrymal secretion and the carrying off of the tears after extirpation of the sac.**

After extirpation of the sac the lachrymation decreases. This does not depend, as Tscherno-Schwartz believes, upon an atrophy of the lachrymal gland. The normal lachrymal gland secretes so little liquid that it can hardly be taken into consideration—perhaps a drop every two hours.

*Discussion.*—AXENFELD stated that the incision for extirpation of the sac should not be made too near the lids, because epiphora would then be likely to result.

SIMON (Berne) recommends the filling of the sac with paraffin before extirpation.

GREEFF believes that the conjunctiva keeps itself moist, and that the lachrymal gland normally is not active and secretes only in conditions of excitation or reflex processes. The conjunctiva itself is a flat gland, the lachrymal gland an irrigating apparatus which is not constantly active.

WAGENMANN expressed himself in a similar manner.

6. WOLFF (Berlin). **On the theory of skiascopy, the determination of refraction by skiascopy, and on his electric skiascopophthalmometer, with remarks on the line of accommodation and the spherical aberration of the eye.**

7. GULLSTRAND (Upsala). **Remarks on the color of the macula.**

Gullstrand explains the yellow color of the macula as a post-mortem change. He examined freshly enucleated eyes which had been put into physiological salt solution. After some minutes the retina separated from the pigment epithelium and could readily be detached. The fresh retina then appeared colorless in the centre.

*Discussion.*—SCHMIDT-RIMPLER believed that in this experiment the coloring matter was dissolved out.

SÄTTLER also found with Hering the yellow coloring matter clearly visible.

8. GREEFF (Berlin). **On a fovea externa in the human retina.**

The methods of fixation and hardening of anatomical preparations generally used do not all permit us to obtain a retina in its exact position; and this is particularly true of the thinnest portion of the retina, the fovea. Here the retina is always folded or arched and detached. We have therefore no convincing representation of the actual configuration of the macula lutea and fovea centralis. Greeff concludes, after measuring the length of the rods and cones in all portions of the retina, that there must be a shallow depression in the external surface of the retina at the macula which he calls a fovea externa. Schultze described a slight bulging forward of the limitans externa at the macula, but this statement was later forgotten or even denied. Kuhnt and Dimmer did not regard it as true.

The longest rods measure  $60\ \mu$ . The cones increase in length from the periphery of the retina, where they are  $22\ \mu$  long toward the centre, being at the margin of the fovea  $60$ – $62\ \mu$  long. Here where the rods begin to disappear the cones have attained the length of the rods. Up to this point the ends form a straight line, but in the fovea the cones grow to be  $85\ \mu$  long—*i. e.*,  $25\ \mu$  longer than the longest rods. Since the line of the choroid and pigment epithelium remains straight, room must be provided for these long cones by an arching forward of the limitans externa of at least  $25\ \mu$ .

The retina, which is  $300\ \mu$  thick, thins down in the fovea to  $100\ \mu$ , thus losing  $200\ \mu$  of its thickness. The outer surface loses  $25\ \mu$  and the inner  $175\ \mu$ . We must thus accept the belief in a fovea externa but a flat one only one eighth as deep as the fovea interna.

SESSION FOR DEMONSTRATIONS. DR. FRANKE (HAMBURG) PRESIDING.

I. HEINE (Breslau). **On rupture of the lamina vitrea in the myopic eye.**

Heine, as he has previously stated (*Arch. f. Augenh.*, xxxviii., p. 288), believes that one will seek in vain for actual inflammatory



changes in myopic eyes. He explains the myopic foci as injuries of the choroid and retina caused by mechanical traction. The lamina vitrea exhibits dehiscences of various sizes, of which the smallest are theoretically of the greatest interest, since they exhibit no further complications than the slightest affections of the pigment epithelium. Apparently we have here the primary condition before us.

Secondarily reactive or regenerative proliferations of the pigment epithelium, and also of the choroid, take place, which may lead to hypertrophic scars and membranes.

There were demonstrations of preparations, photomicrographs, and drawings.

2. GRUNERT (Tübingen). **On retinitis septica and metastatica.**

Grunert reported a case of kryptogenetic septico-pyemia with ocular complications. Two weeks before death a subacute, purulent metastatic ophthalmia developed in the right eye, with an exudation in the pupil and hypotony. Two days before death there appeared in the retina of the other eye hemorrhages and white spots, presenting the picture of so-called retinitis septica.

The anatomical findings in the right eye consisted in a purulent iridocyclitis and infiltration of the vitreous and purulent retinitis of high degree. The condition in the other eye was surprising. Instead of degenerative changes in the nerve-fibre layer, described by Roth, Herrnheiser, and others, there were here dense round-celled infiltrations, arising from the retinal vessels, which had broken through the outer layers of the retina, without, however, involving the choroid in the inflammation. Corresponding to the ophthalmoscopic picture of round hemorrhages with a white centre, the retinal infiltrations were surrounded with ring-shaped hemorrhages. The optic nerve in its retrobulbar portion exhibited numerous abscesses, mostly along the central vessels.

The case proves that the ophthalmoscopically visible retinal changes in sepsis, the so-called septic retinitis of Roth, is not produced alone by degenerative processes of toxic origin, as perhaps the retinitis in pernicious anæmia, leucæmia, diabetes, and the like, but also by metastatic inflammatory processes.

STOCK exhibited anatomical preparations of heredito-specific parenchymatous keratitis, which were particularly interesting as revealing an internal ulcer of the cornea that had run its course.

3. BEST (Giessen). **Preparations showing plasma cells in ribband-shaped keratitis.**

4. DE LIETO VOLARO (Naples). **The pathological anatomy of gerontoxon.**

Volaro, like Takayasu, used sudan III for staining the gerontoxon. He found a fatty infiltration not only in the lamellæ but also in the interstices.

5. MAGEDA (Giessen). **Carcinoma of the lid with mucoid degeneration.**

6. HESS (Wurzburg). **Comparative anatomical investigations on the pigment epithelium.**

He found in the cephalopods a well-marked wandering of the epithelium after illumination, so that the retina became quite black.

7. HAMBURGER. **Experiments illustrating his paper** (abstract farther on).

8. DIMMER. **Photographs of the fovea centralis hardened in bichloride.**

9. LEBER exhibited an apparatus for transillumination of the sclera in order to determine the presence of intraocular tumors.

10. WINTERSTEINER (Vienna). **On secondary changes in circumbulbar atheromatous cysts.**

The degeneration of the walls in atheromatous and dermoid cysts consists in casting-off of the epithelium, tearing of the walls, and the granulating of the defects; rarely such metamorphoses transform the cyst into a solid tumor.

WEDNESDAY, AUGUST 6TH, MORNING SESSION. DR. VOSSIUS (GIESSEN) PRESIDING.

I. BIELSCHOWSKY (Leipsic). **The innervation of the internal recti as producers of latero-version.**

The idea that the associated lateral movements depend upon a common origin of the nerve fibres for one external rectus and the associated external rectus in the nucleus for the external rectus, can no longer be held. Bielschowsky reports a case of injury of the occiput followed by paralysis of both interni in their function as producers of lateral movements but not in their function as convergers. Both external recti retained their normal function, but at first there was a paralysis of the elevators of the eyeballs; restitutio ad integrum. The writer believes that the cause consisted in hemorrhages in the gray matter about the aqueduct of Sylvius.

2. LIEBRECHT (Hamburg). **Pathological changes in the optic nerves in cases of brain tumor and the pathogenesis of choked disc.**

Liebrecht comes to the following conclusions :

1. Choked disc and inflammation of the optic nerves in cases of brain tumor are two distinct things. Choked disc arises from lymph stasis in the nerve, and as such shows no evidences of inflammation.

2. Choked disc may appear before or after inflammation of the nerve.

3. The lymph stasis in the nerve is not of inflammatory origin, but is caused probably by compression of the veins and lymph vessels.

*Discussion.*—LEBER remarked that cavities arising during hardening of the tissues might simulate œdema. Furthermore, œdema may arise from inflammation as well as from stasis.

SCHMIDT-RIMPLER adhered to the Schmidt-Manz theory.

LEVINSOHN objected to the stasis theory since in cases of choked disc lumbar puncture revealed no increased tension in the escaping liquid.

AXENFELD said, on the contrary, that intraspinal tension was not always an indication of intracranial tension.

3. BEST (Giessen). **On congenital chorioretinitis.**

Best discussed the fundus condition characterized by fine light stippling and also spots of pigmentation. He regards these cases as not being due invariably to hereditary syphilis. Among nine cases seen in the Giessen clinic there was hereditary syphilis in none. Possibly these cases belong rather in the category of retinitis pigmentosa.

4. UHTHOFF (Breslau). **A contribution to the knowledge of visual disturbances in brain injuries, with remarks on functional disturbances in brain diseases.**

Uthoff observed for a year and a half a patient with a severe injury of the skull in the left occipital region, brain abscess, and a fatal outcome.

Besides other symptoms, he found right homonymous hemianopsia and functional concentric narrowing of the remaining left halves of the fields; right-sided sensory hemianæsthesia with involvement of the other right sense organs. Such symptoms could be voluntarily produced by moderate compression of the injured spot in the skull. Furthermore, at command a peculiar transient



disturbance appeared in the voluntary movement of the eye to the right, while when a fixated object was moved to the right the ball turned readily.

Later bilateral choked disc appeared with the development of the abscess and disappeared after this was evacuated by operative means.

5. VOSSIUS (Giessen). **Two rare cases of orbital affection.**

a. Necrosis of the bulbar conjunctiva after injury with streptococcus injection and subsequent gangrene of the lid.

b. Actinomycosis of the outer orbital wall and cavernous sinus.

6. BAENZIGER and SILBERSCHMIDT (Zurich). **On the etiology of panophthalmitis after injuries in the harvest field.**

In an incipient panophthalmitis twenty-eight hours after an injury, the authors found only a single bacillus, which belonged to the group of hay bacilli. Pure cultures injected into the eyes of rabbits produced abscess of the vitreous. These hay bacilli often live in the earth, and the authors were able to produce panophthalmitis by inoculating animals with fresh earth from the field in question, and from the eye to cultivate the hay bacillus.

These investigations recalled those of Paplawska and Haab.

*Discussion.*—SCHMIDT-RIMPLER had seen tetanus follow injury with a foreign body coming from the soil.

SATTLER had produced panophthalmitis with the saprophytic prodigiosus.

AXENFELD called attention to the paper by Fromaget on tetanus after ocular injury.

7. WOLFF (Berlin). **On bilateral pathological light reflex at the macula (retinitis serosa centralis, observation with his electric ophthalmoscope), a new diagnostic sign of Bright's disease.**

The author has observed, after excitation of the centre of the retina by light and also in general diseases, changes in the light reflex at the macula which he attributes to an œdema at this place (retinitis serosa centralis).

8. LEVINSOHN (Berlin). **On the condition of the pupil after resection of the cervical sympathetic or removal of the superior ganglion.**

Levinsohn's experiments on animals showed that the greater effect produced by removal of the ganglion than by section of the sympathetic is due to a tonus remaining in the ganglion, which is

dependent upon higher cerebro-spinal connecting twigs. The re-enlargement of the pupil is principally to be attributed to a sphincter paresis. The dilatator tonus is permanently reduced as well by section of the sympathetic as by extirpation of the ganglion.

In many animals, however, it seems to have an increased excitability in the way it is acted upon by certain poisons.

9. GUTTMANN (Berlin). **On experiences with Angelucci's modification of simple cataract extraction and its employment in other operations.**

In performing simple extraction one seizes the expansion of the tendon of the superior rectus with a broad forceps without a catch. The free portion of the forceps at the same time retracts the upper lid from the ball. The operation can thus be done without assistance, and even a speculum is superfluous.

10. HAMBURGER (Berlin). **On the question as to the origin of the aqueous humor.**

Hamburger opposes the view that the pupil is freely pervious. Fluorescein in small quantities introduced into the eye shows the direction of the current.

*Discussion.*—LEBER regarded the method of proof as not convincing.

11. AUGSTEIN (Bromberg). **On perceptible movement of the blood in new-formed corneal vessels and its significance.**

The author has observed the movement of the blood in corneal vessels only when they were beginning to degenerate. Gradually the blood current is interrupted, and finally the vessels become empty. Possibly this sign may have some prognostic value.

*Discussion.*—GRUNERT has often seen circulation in corneal vessels. It is more evident under atrabilia.

LEBER stated that in the development of such vessels there was a stage in which the circulation ceased, namely, before the ends of the new vessels became united.



## REPORT OF THE OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

BY MR. C. DEVEREUX MARSHALL.

FRIDAY, NOVEMBER 14, 1902. A. STANFORD MORTON, F.R.C.S.,  
VICE-PRESIDENT, IN THE CHAIR.

### **Avulsion of the eyeball with midwifery forceps.**

Mr. SIMEON SNELL (Sheffield) related this case. The child was admitted on the day following its birth with the left eyeball lying on the cheek, being connected to the orbit merely by bands of conjunctiva. The mother had a very contracted pelvis and delivery was effected with the greatest difficulty with forceps which had caused the injury to the eye. The globe was removed with fully an inch of optic nerve attached to it.

### **Paralysis of the upward movements of the eyeball.**

Mr. SNELL related this case. The patient was a man aged fifty who after being at work all day came home to tea, fell asleep, and remembered nothing more till four the next morning. His wife called him three times during the night but he had no recollection of it. When he awoke he had severe pain in the forehead and diplopia. Three days later the movements of the eyeball were normal except upwards. On attempting to do this the lids were raised but the eyeballs did not move and he could not follow a moving object upwards. The vision in both eyes was normal. The diplopia disappeared two days later and a month later the movements of the eyeballs had returned perfectly.

### **Retinitis pigmentosa occurring in five generations.**

Mr. SNELL mentioned the case of a man aged forty-six who since childhood had found great difficulty in going about at night time. The sight now was only  $\frac{2}{20}$  in the right and  $\frac{1}{20}$  in the left.

The ophthalmoscope showed a typical case of retinitis pigmentosa. The family history was remarkable. The first known to be affected was his great-grandfather. His only daughter was affected and from him sixty-nine individuals had been descended. Of these twenty-eight had night blindness. The patient's father had eleven children of whom five were affected: the patient himself had eleven children of whom seven were affected, viz: five boys and two girls. There was no evidence of consanguinity. No generation was skipped and it affected equally the males and females. Night blindness showed itself in early childhood and at about the age of forty some more and some less of the affected ones had become practically blind.

The following card specimens were shown:

Mr. JESSOP: A case of sympathetic ophthalmitis with cysts of iris. Mr. ROLL: A case of congenital ophthalmoplegia. Mr. N. B. HARMAN: Two cases of fissura facialis. Mr. MACCALLAN: Case of lymphangiectasis of the conjunctiva. Mr. GRIMSDALE: Paralysis of both external recti. Mr. ARNOLD LAWSON: Paralysis of the sympathetic.

**On the necessity for the use of color names in a test for color blindness.** By F. W. EDRIDGE-GREEN, M.D., F.R.C.S.

The first requirement of a test for color blindness is that color names be used and that the person to be examined should employ and understand the use of the color names—red, yellow, green, and blue. I can say in the most emphatic manner that no test which ignores color names can be efficient. I predicted that if color names were ignored in the Board of Trade tests normal-sighted persons would be rejected, and this prediction was fulfilled. Over 38% one year and more than 42% another year were found to be normal-sighted and to have been rejected wrongly. An engine driver or sailor has to name a colored light when he sees it, not to match it. He has to say to himself, "This is a red light, therefore there is danger," and this is practically the same as if he had made the observation out loud. Even the method of matching colors should, in order to be efficient, be one of mentally naming them. In my Classification Test I use colored materials of different kinds, as similarity, other than that defined by the word "color," is the great source of error in a test of this kind. The color blind may be divided into two distinct classes, which are independent of each other, but which may be associated. The first class includes those who are not able to see certain rays of the

spectrum ; their spectrum is shortened at one or both ends. If a man have shortening of the red end of the spectrum, he will not be able to see a red light at a distance though he might be able to pick out all the green wools in the Classification Test. A man of this kind when shown the red light of my Lantern Test declares that there is no light visible, at once demonstrating his incapacity. The second class of the color blind make mistakes not because they can not perceive a certain color, but because they are not able to recognize the difference between the colors which is evident to normal-sighted persons. Both these classes are represented by analogous conditions in the perception of sounds. The first class of the color blind is represented by those who are unable to hear very high or very low notes—that is to say, these notes are non-existent to them. The second class is represented by those who possess what is commonly called a defective musical ear. Normal-sighted persons see six definite colors (points of difference) in the spectrum. The second class of the color blind see five, four, three, two, or one color, according to the degree of the defect ; and they confuse the colors of the normal-sighted which are included in one of their own. If the normal-sighted be designated hexachromatic, those who see five colors may be called pentachromatic, those who see four, tetrachromatic, those who see three, trichromatic, those who see two, dichromatic, and the totally color blind, monochromatic. The degree of the defect will be recognized by the names given to different colors. The pentachromatic will miscall orange. The tetrachromatic will in addition make mistakes with regard to blue. It is not necessary to reject either of these two varieties, because I have never succeeded in making them confuse the colors, red, yellow, green, and violet. The trichromatic are always in difficulty over yellow and miscall it red, green, or red-green, and for practical purposes must be excluded as color blind. The dichromatic confuse red, orange, yellow, and yellow-green on the one hand, blue-green, blue, and violet on the other.

REPORT OF THE MEETINGS OF THE OPHTHALMOLOGICAL SECTION OF THE NEW YORK ACADEMY OF MEDICINE, HELD ON MONDAY EVENINGS, OCTOBER 20, AND NOVEMBER 17, 1902.

BY DR. HENRY H. TYSON, SECRETARY.

MEETING OF OCTOBER 20th.

PRES. DR. JOHN E. WEEKS IN THE CHAIR.

Dr. SKEEL presented a **case of linear extraction of soft cataract**. Patient was a young woman with a traumatic cataract. Vision  $\frac{5}{200}$  when operated upon. Extraction performed under ether anæsthesia. He attempted to remove a quadrilateral piece of capsule but succeeded in removing a circular piece. After removing the lens he syringed the capsule with warm saline solution, which cleared the pupil immediately. Vision obtained  $\frac{2}{80}$ . He prefers this method to the needle operation and waiting for the absorption of the lens matter.

Dr. VALK referred to a case of traumatic cataract operated upon with peripheric section with excellent result.

Dr. SEABROOK stated that he had performed several extractions of traumatic cataracts with peripheric section with good results. His experience with linear extraction had not been so good as to the immediate clearing of the pupil.

Dr. WEEKS stated that his operations with linear extraction had not always been free from complications. He often had iritis, anterior synechiæ, etc., result. In children under twelve years of age he prefers needling, even if it requires three operations.

Dr. SKEEL stated that he had never seen any disastrous results from linear extractions, the only complication was iritis. He admitted that needling was the safest method in children; but when the section was made entirely in the cornea, he thought the



linear method perfectly safe. As to the capsulotomy, he attempted to remove a quadrilateral piece of capsule and had succeeded in many cases. He does not introduce forceps into the eye, but removes the cut piece of capsule by syringing, while removing the detritus in the same manner.

Dr. KOLLER presented a **case of keratitis superficialis punctata (Fuchs)**. Sclera was injected. Cornea apparently clear and polished, but when examined with oblique illumination a number of small dots were found scattered over the cornea just beneath the epithelium. Vision was not much disturbed. These cases are usually complicated by some respiratory trouble. Similar to herpes febrilis they usually clear up in a couple of months. Treatment same as iritis serosa.

Dr. WEEKS stated that the case resembled those described by Fuchs, who states that the epithelium was not only raised but roughened. Cause is obscure.

Dr. FRIEDENBERG stated that he had seen similar cases which had yielded in time to the ordinary treatment of iritis serosa.

Dr. LAMBERT presented a **case of epithelioma of the lid** which had been **treated by the X-ray**. Case was that of an adult, and was of six or seven years' duration. It had been cured in seven sittings of fifteen to twenty minutes each; clinically, it was a clear case of epithelioma, but no microscopic report was made. He had treated one other case with equally good result.

Dr. MORTON stated that superficial non-nodular epitheliomas with no glandular involvement can be positively cured. The case referred to him by Dr. Lambert was one in which the epithelioma was about the size of a silver quarter dollar and it had existed five years. The one on the right side of the face had received thirteen treatments, while the one on the left side received six treatments. Both were cured. He dislikes disturbing epitheliomas for the purpose of obtaining sections, as he has seen them, take on a phlegmonous inflammation, which complicates later treatment. There are two methods of treatment:

1. Severe—producing deep burn and necrosis of tissue.
2. Lenient—producing slight burn, consists of fifteen minutes treatment three times a week with moderate X-ray used about three feet distant. He avoids breaking down tissue by not pushing treatment. For lupus he prefers the actinic rays or Finsen's rays.

Dr. BARNES stated that he had treated with the X-ray a case of



epithelioma of the lids in which he had obtained a good result after six sittings.

Dr. DUANE inquired as to the severity of cases in which the X-ray might be used with expectations of good results.

Dr. MORTON stated that he thought every case should be treated at first with the X-ray, as it will do no harm if used properly, and it can produce excellent results. He then described two severe cases in which he had obtained good results. He thought that eyelid cases do better than some of those on the cheek.

Dr. SEABROOK referred to a case of epithelioma of the lids and eye which was treated for six months by the X-ray. The skin cleared up, but where the cornea and sclera were involved it did not do well.

Dr. MORTON thought the result was due more to the method of using the X-ray than anything else.

Dr. WEEKS presented a **case of lenticonus posterior**. The elevation on posterior aspect of the lens was about one half *mm* in height with a small opacity on posterior surface due to remnants of foetal blood-vessels.

Dr. MEIERHOF read a **report of a case of spontaneous hemorrhage from the conjunctiva in infants**. He stated that hemorrhage of a spontaneous nature in the new-born was not infrequent, but that from the conjunctiva it was comparatively rare, and might be fatal. His case was that of a male child three days old. A solution of silver nitrate had been applied to the lids at birth. The hemorrhage had continued seven hours before he had examined it. The blood formed a clot in the conjunctival sac, and when the clot became too large to be retained, it would be expelled with fresh hemorrhage. This occurred at regular intervals of a few minutes. It was difficult to see the site of the origin of hemorrhage on account of the profuse discharge of blood. A mixture of suprarenal extract was freely applied to the conjunctival sac, without effect. Then gelatine was poured into the conjunctival sac and used externally, which controlled the bleeding for half an hour, but the child crying and straining caused a renewal of the hemorrhage. Finally, upon everting the upper lid, a bleeding spot the area of a split pea in the centre near the edge of the conjunctiva was discovered. The everted lid was drawn up on the supraorbital ridge and firm pressure with iodoform gauze controlled the hemorrhage. The everted lid

was kept in place with a bandage for three hours, when the bandage was removed, and no further hemorrhage occurred. There was no family history of syphilis, tuberculosis, or hemophilia.

Dr. FRIEDENBERG referred to a case he had seen, and which Dr. Jacobi thought was due to infantile scurvy. He stated that Dr. Jacobi advised that the blood be examined in all suspected cases.

Dr. H. R. PRICE read a **report of sympathectomy in a case of glaucoma secondary to hemorrhagic albuminuric retinitis.** Dr. Price's patient was one in which he did not consider an iridectomy a safe procedure, and he had Dr. Rogers perform a sympathectomy; good results and no complications. There have been transient increases in tension since, but vision remained at the full improvement obtained after the operation.

Dr. ROGERS, who performed the operation on Dr. Price's case, **demonstrated the operation upon a prepared specimen.**

MEETING OF NOVEMBER 17th.

PRES. DR. JOHN E. WEEKS IN THE CHAIR.

Dr. REESE presented a case of **melano-sarcoma (traumatic) of the corneal limbus.** He gave the following history: Patient, man aged fifty-five years, was struck in the left eye with a small stone, which caused the eye to bleed. One month later he noticed a dark mass growing at the outer margin of the cornea. When examined six weeks ago it was found that the anterior surface of the cornea was almost entirely covered by a pigmented tumor which sprang from the outer sclero-corneal margin. It was also found that the ocular conjunctiva was pigmented downward and outward for about 2 mm from the origin of the growth, while the inferior palpebral conjunctiva presented a few pigmented spots. The tumor was not adherent to the anterior surface of the cornea, consequently, after cutting off enough of it to expose the pupil, he had  $\frac{2}{10}$  vision and the fundus was normal upon examination. A microscopical examination showed melano-sarcoma with spindle cells. He thought that the growth started probably from the ciliary body and choroid.

Dr. POOLEY thought it was a melano-sarcoma of the sclero-corneal limbus.

Dr. CALLAN stated that he had seen two or three cases in

which it appeared to spring from the ciliary body, but upon close examination it did not do so, but started from the sclero-corneal limbus.

Dr. KOLLER presented a case of **operation of anterior synechia after Lang's method**. He attempted at first to cut the synechia with Knapp's knife-needle, but the point engaged Descemet's membrane, which prevented a sweeping motion of the knife necessary to cut it. One week later he used Lang's method of first introducing knife-needle and withdrawing it without losing any aqueous, and then inserting a blunt-pointed knife-needle through the opening thus made, and by a sweeping motion succeeded in cutting the synechia, with a good result.

Dr. OATMAN presented a case of **Mules's operation, in which a paraffin** instead of a glass ball **was used as the artificial vitreous**. The stump obtained made an excellent cushion for supporting an artificial eye, with good motility.

Dr. WOLFF presented a case of **traumatic cataract with a cilium implanted in the lens**. The patient had been struck in the eye with a wire. An operation for the removal of the lens mass was performed, and three days later a cilium was discovered implanted in the remaining lens mass.

Dr. MARPLE presented a case of **sarcoma of the choroid**. The patient had noticed vision failing about one week ago and thought that she required glasses; upon examination the fundus presented the appearance of a leuco-sarcoma of the choroid.

Dr. P. A. CALLAN read a paper, "**Should retinal hemorrhages in one eye in simple glaucoma debar an iridectomy in the fellow eye?**" He stated that he did not intend to raise the question of operating in hemorrhagic glaucoma. In such cases there was always an interval between the retinal hemorrhages and the subsequent attack of glaucoma, which was of the inflammatory type. The cases related were of the non-inflammatory form, viz., simple glaucoma. The first case had retinal hemorrhages of the right eye and had never been operated upon. He performed an iridectomy on the left eye three years ago and no bad results had been manifested up to the present time. The second and third cases had been operated upon and were followed by retinal hemorrhages—in the second case at the end of three months, and in the third case at the end of the eighth month. In two of the three cases he operated notwithstanding the hemorrhages. In the other case the hemorrhages affected



the more diseased eye. In none of the cases was the tension very high. He concluded, that although a retinal hemorrhage followed an iridectomy in two of the cases, the interval of time between the operation and the hemorrhage was so long that he could not see any connection between the two, and that the operation was not the cause. A retinal hemorrhage in simple glaucoma is not a bar to an iridectomy on the fellow eye, provided the tension is not too high. Ordinarily the tension is not much increased in these cases, and if in our judgment an iridectomy is required in similar cases, we are justified in operating.

Dr. VALK stated that he thought that an iridectomy should be performed in such cases.

Dr. MITTENDORF agreed with Dr. Callan and thought operation advisable, being guided by the tension if not about  $T + 1$ .

Dr. WEEKS emphasized the point that in these cases the hemorrhage was not the cause of the glaucoma.

Dr. CALLAN stated that he had operated upon patients with vision  $\frac{2}{3}$  with prodromi in one eye, and glaucoma with very poor vision in the other eye, because glaucoma is sure to occur in the second eye; and the majority of oculists agree that the sooner we operate in glaucoma the better the prognosis and the results.

Dr. DUANE read a paper on "**Some types of retinitis and chorio-retinitis.**" The first type comprised cases of **isolated focal chorio-retinitis**. These, he said, were distinguished by their acute onset, rapid course, and, on the whole, favorable prognosis. They occur especially in young people, and often without assignable cause. They are marked by the presence of a single circumscribed exudate, situated usually not very far from the disc and forming a whitish mass, which may be either prominent and pointed, or low and flattened, and which is often associated with considerable œdema of the surrounding retina, but not often with much engorgement of the papillary vessels or much swelling of the nerve. The amount of impairment of vision depends on the site of the exudate, varying from  $\frac{2}{3}$  or better to  $\frac{2}{20}$  or  $\frac{3}{20}$ . A more or less absolute scotoma, which may be either positive or negative, frequently remains even after the vision is otherwise restored to normal. The salicylates, calomel in broken doses, and rest in bed furnish the best treatment. Under the second type, that of **plastic chorio-retinitis**, he included not only ordinary retinitis, but also all other varieties of plastic formations in the retina and choroid. He defined it as an affection marked by pretty sharply



circumscribed whitish aggregations of connective tissue which may be sunk in the substance of the retina and choroid, and may stretch along the surface of the retina, or may project out into the vitreous, in which case they sometimes reach forward as far as the lens and ciliary body. Such aggregations may appear under the form of flat, more or less tenuous membranous patches, branching striæ, dense and thick nodular-looking masses, large plateau-like elevations, dense fibrous strands, or fleecy outgrowths. They are attributable to connective-tissue organization taking place in fibrous exudates. The exudates themselves may develop in conjunction with a disseminated choroiditis, which, however, is at times quite inconspicuous; or they may accompany a retinitis, in which case they very frequently originate in a patch of hemorrhage; or they may also probably occur as the result of hemorrhage without inflammation of either retina or choroid. The underlying cause for all these changes (choroiditis, retinitis, hemorrhages, exudates, and connective-tissue products) may be traumatism or may be syphilis, while in other cases still no cause can be made out. (In this statement the author followed Weeks's etiological classification of retinitis proliferans, which latter he regarded as simply one of the varieties of plastic chorio-retinitis.) Once developed, the plastic products are apt to remain unchanged for years, although the slighter formation seemed to be even then still capable of absorption. On the other hand, especially when there are recurrent hemorrhages, the connective-tissue growths may be added to from time to time, thus causing progressive deterioration of the eye. Plastic chorio-retinitis is often accompanied by a great reduction in sight, due partly to the connective-tissue outgrowths, partly to the associated lesions. Mercury and the iodides constitute the best treatment.

The third type considered was that of **retinitis circinata**, the author describing a case having all the characters given by Fuchs (discoloration in the macula and an interrupted ellipse of lobulated non-pigmented white spots surrounding the macula). Also a case of diabetic retinitis, in which white spots were present, typical in arrangement, but without the macular discolorations; and lastly, a case of diabetic retinitis, in which the picture of a retinitis circinata was present for a time and was then followed by that of a retinitis proliferans. The last case thus formed a sort of connecting link between types two and three.

Dr. OPDYKE read a paper, "**The close analogy of trachoma**

**to adenoids."** Dr. Opdyke stated that he found in the so-called "operative" forms of trachoma, on an average, two out of every three cases had pronounced adenoid vegetations of the pharynx, with all the typically marked symptoms of this affection. He noted the fact that both diseases have many of the same etiological factors: poor environment, bad hygiene, overcrowding, heredity, and the dyscrasiæ, and that all authorities agreed that the liability of an attack of trachoma depends most strongly on the state of the general health at the time of exposure. He thought that none of the conditions mentioned could possibly bring about this condition more forcefully than the evil results subsequent to adenoid vegetations in the pharynx, and that it was not always necessary to hunt for certain race, hygienic causes, or even contagion, as these may be but addenda to a more exciting and persistent factor. He claims that a child with adenoids will contract trachoma quicker than one without them, on account of the lowered vitality resulting from the adenoids. He considers adenoid vegetations to be the primary factor and trachoma as being its true sequel.

SYSTEMATIC REPORT ON THE PROGRESS OF  
OPHTHALMOLOGY IN THE FIRST  
QUARTER OF THE YEAR 1902.

BY DR. G. ABELSDORFF, IN BERLIN; PROF. ST. BERN-  
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R. GREEFF, PROF. C. HORSTMANN,  
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WITH THE ASSISTANCE OF

Dr. A. J. ALLING, New Haven; Prof. E. BERGER, Paris; Dr. DALÉN, Stock-  
holm; Dr. J. HERRNHEISER, Prague; Prof. HIRSCHMANN, Charcow;  
Dr. J. JITTA, Amsterdam; Dr. KRAHNSTÖVER, Rome; Mr.  
C. DEVEREUX MARSHALL, London; Dr. P. VON  
MITTELSTÄDT, Metz; Prof. DA GAMA  
PINTO, Lisbon; and others.

Translated by Dr. WARD A. HOLDEN.

Sections I.-III. Reviewed by PROFESSOR HORSTMANN,  
Berlin.

I.—GENERAL OPHTHALMOLOGICAL LITERATURE.

1. **Groenouw** and **Uthoff**. *Graefe-Saemisch*, 2d edition.
2. **Greeff**. The structure of the eyelid. Demonstration plate. Edited by Magnus. xxiii. Breslau, 1901, Kern.
3. **Magnus**. Guide to the diagnosis of central disturbances of the optical apparatus. *Ibid*.
4. **Elschnig**. Stereoscopic-photographic atlas of the pathological anatomy of the eye. Parts iii.-iv. Vienna and Leipsic, 1902, Braumüller.
5. **Darier**. *Ocular Therapeutics*. 2d edition, Paris, 1902.
6. **Widmark**. On the importance of venereal diseases in the production of blindness. *Hygiea*, March, 1902.
7. **Bock**. The first ten years of the eye department of the Laibach hospital. Vienna, 1902, J. Safar.

8. **Pagenstecher.** Forty-sixth annual report of the charitable ophthalmic institution at Wiesbaden. Wiesbaden, 1902.
9. **Bryson.** Defective vision in children. *Lancet*, March 1, 1902.
10. **Knapp, H.** A few personal recollections of Helmholtz. *Four. Amer. Med. Assoc.*, March, 1902.
11. **Wood.** Hermann von Helmholtz, the inventor of the ophthalmoscope. *Ibid.*
12. **Hall, W.** The contributions of Helmholtz to physiology and psychology. *Ibid.*
13. **Massachusetts Charitable Eye and Ear Infirmary.** *Seventy-sixth Annual Report, 1901.*
14. **Brooklyn Eye and Ear Hospital.** *Thirty-third Annual Report, 1901.*
15. **New York Ophthalmic and Aural Institute.** Dr. H. Knapp, executive surgeon. *Thirty-second Annual Report for the Year Ending Sept. 30, 1901.*
16. **Jensen.** Second report of his eye clinic. Feb., 1902.

The thirty-seventh and thirty-eighth fascicles of *Graefe-Saemisch*, by GROENOUW (1), treat of the ocular affections in diabetes mellitus, diabetes insipidus, oxaluria and phosphaturia, gout, corpulency, and scrofula; further of the ocular affections in conditions of general weakness, the effect of malignant tumors elsewhere upon the eye, the condition of the eye in sleep and in death, and the hereditary ocular affections.

GREEFF (2) presents a plate of folio size well representing the human lid, which is of great value in ophthalmic teaching.

The second edition of the plate for the diagnosis of central disturbances of the optic apparatus, by MAGNUS (3), is slightly altered from the first edition.

The third and fourth parts of the stereoscopic-photographic atlas of the pathological anatomy of the eye, by ELSCHNIG (4), concludes the work. It contains thirty-two heliotype plates, representing some divided and some undivided eyes of natural size. The execution is very good.

DARIER'S (5) work is a collection of his published views and experiences, particularly with regard to the subconjunctival injection of dionin, acoin, protargol, and massage. The book cannot be considered complete, since many new preparations are not mentioned, and it is questionable whether the new remedies commended will accomplish all that he claims for them.

According to WIDMARK (6), 6.52 % of all the blindness in Sweden is due to gonorrhœa. In regard to syphilis, the exact numbers are harder to obtain, because many cases undoubtedly due to syphilis are classified under other heads. He believes



that probably 15 % of all the blindness in Sweden is due to syphilis. A comparison of his statistics for Sweden with those of Magnus for Germany shows that gonorrhœa in Germany is twice as often a cause of blindness as in Sweden; but he believes that his percentage of 20 for both gonorrhœa and syphilis will hold good for other countries. In conclusion, he discusses the changes in statistics brought about by the use of the Crede method.

DALÉN.

BOCK (7) in the first ten years of his service in the hospital at Laibach saw 7637 patients and performed 3222 operations, of which 913 were for cataract. Among 637 extractions upward with iridectomy, five eyes were lost by suppuration of the wound, fifteen from affections of the eye previously existing, two from hemorrhage, three from the general condition of the patient, and seven through negligence of the patient.

In 1901, PAGENSTECHE (8) treated 2937 eye patients, 954 of whom had hospital treatment, and 128 cataract operations were performed. He adds some remarks on so-called sympathetic glaucoma.

In his report to the Derby School Board, Dr. BRYSON (9) states that out of 700 school children examined by him he found defective eyesight in two thirds of them.

21,880 new eye patients were treated in the out-patient department of the MASS. CHARITABLE EYE AND EAR INFIRMARY (13), 1636 in the hospital wards. Among the 991 operations, there were 206 for cataract extraction and 65 for iridectomy.

For the year 1901, the BROOKLYN EYE AND EAR HOSPITAL (14) had 8122 new patients for the eye. Of the operations 53 were for cataract extraction and 12 for iridectomy.

The NEW YORK OPHTHALMIC AND AURAL INSTITUTE (15) report shows 9129 new patients in the eye department in the dispensary and 537 in the hospital. There were 578 operations (excluding minor ones), of which 137 were cataract extraction and 97 iridectomy.

JENSEN (16) gives a statistical report of the eye diseases treated in his clinic in 1900-1901, and discusses many of the cases which presented points of interest. The number of the patients was 3389; 121 major operations were performed.

## II.—GENERAL PATHOLOGY, DIAGNOSIS, AND THERAPEUTICS.

17. **Heine.** The influence of intra-arterial tension on the pupil and intra-ocular tension. *Monatsbl. f. Augenheilk.*, xii., p. 25.

18. **Römer.** Experimental basis for clinical experiment with a serum therapy of serpent ulcer after investigations on pneumococcus immunity. *Graefe's Archiv*, lix., p. 99.
19. **Straub.** Asthenopia. *Geneeskundige Bladen mit Klinick en Laboratorium*, 1901, No. xii.
20. **Seydel.** A contribution to the relearning to see of persons who have become blind. *Klin. Monatsbl. f. Augenheilk.*, xl., p. 97.
21. **Schleich.** Visible circulation in the superficial conjunctival vessels. *Klin. Monatsbl. f. Augenheilk.*, xl., p. 177.
22. **Thorner, W.** On the theory of the determination of refraction. *Arch. f. Augenheilk.*, xlv., p. 110.
23. **Roscher.** On the intraocular use of the galvano-cautery. *Münch. med. Wochenschr.*, 1901, 12, p. 481.
24. **Vinci.** On the diffusion into the eye of some substances injected into the temple. *Ann. di Ottalm.*, xxx., 7.
25. **Dudley, W. H.** Metamorphopsia varians. *Journ. Amer. Med. Assoc.*, Jan. 4, 1902.
26. **Oliver.** Clinical history of a case of blindness from congenital deformity of occiput. *Amer. Journ. Med. Sciences*, Jan., 1902.
27. **Spiller, Wm. G.** A case of complete absence of the visual system in an adult. *Univ. of Penn. Med. Bulletin*, xiv., Feb., 1902.

In experiments on nine cadavers into whose arteries water was introduced, HEINE (17) found in four cases a marked effect upon the pupil. Miosis came on with evident blurring of the markings on the iris, a fact which indicates that there are in fact tissue lesions in the iris with the passing out of blood and water into the stroma of the iris, *i. e.*, not with a dilatation of the vessels alone. From this one might conclude that even excessive arterial tension in life would not affect to a marked degree the size of the pupil. Experiments on living animals also showed that increase of arterial tension *intra vitam* did not affect the width of the pupil. The intraocular tension, on the contrary, was affected by the arterial tension.

The detailed paper by RÖMER (18) can only be reviewed properly when the experiments have been carried farther. He was able to show that in an immune organism the pneumococcus could not develop, and that this protection of the body in general extended to the eye also. This protection obtained in animals must also be obtained in man, and it will then be possible with the further perfection of the serum to combat successfully many diseases.

STRAUB (19) discusses asthenopia, its causes and its therapy, from a purely clinical standpoint.

JITTA.

SEYDEL (20) reports the case of a girl of ten who became completely blind in her seventh year, the left eye having been removed on account of an injury; the sight of the right having been lost from sympathetic ophthalmia. Three years later the opaque lens was removed, leaving an opening in the pupillary area which gave her a certain amount of vision. The child, however, had entirely forgotten how to see, and had to learn again by continued practice.

The second patient was a man of thirty-one, whose left eye was penetrated by a knife blade in his fourth year, and sympathetic ophthalmia destroyed the sight of the other. An iridectomy was made and discission attempted, the latter causing a luxation of the cataractous lens downward. This patient also had forgotten how to see, but three weeks' practice put him again in full possession of his optical faculties. The two cases show that even in the seventh year one may wholly forget how to see. The degree and permanence of this forgetting are dependent upon psychical causes.

With good focal illumination and a magnification of twenty-five diameters, SCHLEICH (21) was able to recognize the blood current in the superficial vessels of the eye. Not only in the large veins but also in the finer arterial and venous vessels down to a diameter of  $0.01\text{ mm}$  could the circulation be observed. In the thin vessels the movement of the irregularly distributed red corpuscles could be followed.

THORNER (22) calls attention to the difference in the estimation of refraction according to the point from which the far point is measured.

Since in high myopia these differences may be very considerable, he proposes to distinguish two sorts of accommodation—the inner and the outer. The former he reckons from the nodal point of the eye, and the latter from a point  $1\text{ cm}$  anterior to the cornea. Since it is easy to determine the outer refraction, but not easy to determine the inner, Thorner has given a table in which every value found for the external refraction is accompanied with the corresponding value of the internal refraction. He discusses further the point that is to be considered the zero point in the usual methods of objective determination of the refraction. Finally he describes the method of objectively determining refraction with his ophthalmoscope, which is free from reflexes, and shows how, by means of a special arrangement, the



plane of the iris in the person examined can be kept in a constant location.

ROSCHER (23), in five cases of incipient panophthalmitis, employed the intraocular galvano-caustic method of Millinger with success.

OLIVER'S (26) case presented moderate exophthalmus, divergent strabismus, and rotary nystagmus. There was absolutely no other lesion of the eyes. There was no light perception. The occipital protuberances were almost entirely wanting. The case is an extremely rare instance of imperfect development of the visual cortex, with loss of its function. ALLING.

SPILLER (27) had the exceptional opportunity of making a pathological examination of a case of absence of the visual system in an idiot, twenty-two years of age. The body was that of a child apparently about twelve years old. The palpebral fissures were extremely small, and the orbits contained only fibrous connective tissue, although permission was not given to remove their contents. Nothing resembling eyeballs could be seen. There were no optic foramina, no optic nerves, chiasm, or optic tracts. There was no sign of an external geniculate body on either side, and the optic thalamus had no fibres resembling optic tract entering it. The posterior part of the thalamus was large and rounded. The anterior corpora quadrigemina were as large as the posterior. The occipital lobes were small and the cuneus was poorly developed, with the calcarine fissure short.

Microscopic examination showed nerve cell bodies slightly less numerous than normal in the cortex of the calcarine fissure. The optic radiations were not entirely absent, but not very distinct. Meynert's fibres, which are supposed to connect the optic tract with the third-nerve nucleus, were fully developed, which would indicate that they are not concerned in the pupil reflex alone. Only a few fibres were found in the pulvinar of the optic thalamus. All the ocular nerves were well developed, except the two sixth nerves—a fact which might be explained on the supposition that rudimentary muscles were present in the orbit. The following conclusions are drawn by the author: The chief "primary" optic ganglion is the external geniculate body. The pulvinar of the optic thalamus is an important "primary" optic centre. The anterior quadrigeminal body has not an important relation to vision. The hypothalamic body, the habenula, and the internal geniculate body, probably, are not part of the visual system. The



cortex of the calcarine fissure may contain nearly the normal number of cell bodies, even though the visual system may be undeveloped. The nerves to the ocular muscles and their nuclei may be developed, even though the visual system is absent.

ALLING.

### III.—INSTRUMENTS AND REMEDIES.

28. **Salfner.** Clinical observations on jequiritol and jequiritol serum. *Arch. f. Augenheilk.*, xliv., p. 322.

29. **Hummelheim.** On jequirity therapy. *Zeitschr. f. Augenheilk.*, vii., p. 290.

30. **Guttman.** Ichthargan in ophthalmology. *Arch. f. Ther. u. Hyg. d. Auges*, June 5, 1902.

31. **v. Arlt, F. R.** On the use of cuprum citricum in trachoma. *Centralbl. f. prakt. Augenheilk.*, xxvi., p. 80.

32. **Phisalix.** Physiological investigations in regard to the effect of ibogaine upon the nervous system in general, and on the cornea in particular. *Bull. de la soc. de biologie de Paris*, Dec. 7, 1901.

33. **Galezowski.** On hermophenyl and its employment in ophthalmology. *Rec. d'opht.*, xxiv., 1, p. 55.

34. **Batalow.** Report on the action of dionin upon the eye. *Wjest. Ophth.*, No. 1, 1902.

35. **Annin.** The action of tropococain upon the eye. *Ibid.*, No. 2, 1902.

36. **Volkman.** The theory of eye magnets. *Klin. Monatsbl. f. Augenheilk.*, xl., p. 1.

37. **Volkman.** A new eye magnet. *Ibid.*, p. 116.

38. **Rémy.** Applications of the diploscope to the diagnosis and treatment of alterations of binocular vision. *Rec. d'opht.*, xxiv., 1, p. 1.

39. **Schmidt-Rimpler.** On a new method of seeing objects in relief with one eye only. *Centralbl. f. prakt. Augenheilk.*, xxvi., p. 1.

40. **Landolt.** A cystotome. *Arch. f. opht.*, xxii., 2, p. 90.

41. **Pooley.** The sideroscope. *N. Y. Med. Journ.*, March 8, 1902.

42. **Williams, C. H.** Incandescent electric light for ophthalmoscopic examinations. *Trans. Amer. Ophth. Soc.*, 1901.

SALFFNER (28) treated fourteen cases of chronic eczematous keratitis with jequiritol. Usually there were fresh infiltrations with old scars, and often there was pannus. All had failed to improve under other treatments. After jequirity treatment the dense opacities were always somewhat cleared up and the eczematous processes were lessened. The results were less favorable in corneal opacities due to parenchymatous processes.

According to HUMMELHEIM (29) jequiritol has the same curative effect as jequirity. But it has the advantage that the dosage may be regulated and a regular increase in the action

of the abrin obtained, so that a permanent injury of the eye may be avoided. It is useful in trachoma and trachomatous pannus.

GUTTMANN (30) used ichthargan on sixty-one eye patients. He found it useful in "Schwellungs-catarrh," but in blennorrhœa further experiments must be made. It diminishes the secretion in dacryocystitis. It is especially recommended in trachoma and trachomatous pannus. A 0.5-2 % solution is dropped into the eye.

ARLT (31) recommends in trachoma cuprum citricum in 5-10 % ointment. This is placed deep in the cul-de-sac and massage is then performed.

PHISALIX (32) found that the alkaloid ibogaine obtained from a plant in the Congo called iboga, when instilled in 1 % solution into the eye caused anæsthesia of the cornea and congestion of the conjunctiva. The pupil is not affected. BERGER.

GALEZOWSKI (33) recommends as an antiseptic a new mercurial preparation—hermophenyl, which does not precipitate albumen. It is used in 1:2000 aqueous solution, or, when there is pain, combined with dionin (hermophenyl 0.05, dionin 0.15, vaselin liq. 25.00 three times daily). It is adapted for subcutaneous use in the treatment of syphilitic affections of the eye.

BERGER.

The results of BATALOW'S (34) clinical experimental investigations are as follows: 1. Dionin in solution (3-10 %) or powder form when introduced into the conjunctival sac always causes injection, a sensation of burning, lachrymation, and often a non-inflammatory chemosis. 2. The appearance of chemosis and its extent depend upon the strength of the solution, the age of the patient, and his individual disposition; when the use of dionin is repeated the chemosis does not appear. 3. Dionin is not a myotic; the contraction of the pupil which it causes is only a reflex symptom. 4. Dionin does not affect the accommodation. 5. It does not increase intraocular tension. 6. It favors diffusion from the conjunctival sac into the anterior chamber. The microscopic examination of dogs' eyes after the use of dionin revealed dilatation of the blood and lymph vessels of the conjunctiva. 7. Dionin favors the absorption of fresh corneal opacities, phlyctenulæ, episcleritic foci, and corneal infiltrations. 8. The intense analgesic effect of 10 % dionin solution is manifest in all cases, particularly in iridocyclitis, acute glaucoma, and similar processes.

HIRSCHMANN.

ANNIN (35) uses 3-5 % solutions of tropococain mur. for instillations and a 2 % solution in salt for subconjunctival and subcutaneous injection. Even after long boiling these solutions remain clear and their efficacy unchanged. After instillation the cornea retains its lustre, but becomes anæsthetic in a minute. Complete anæsthesia lasts from two to seven minutes, and incomplete from two to thirteen minutes. It exercises no effect upon the pupil or the intraocular tension. In eye operations 2-3 % solutions are used.

HIRSCHMANN.

According to VOLKMANN (36) the size of an iron splinter is of less importance than its shape in regard to the strength of magnet required for its extraction. VOLKMANN'S (37) ideas as to the dimensions and shape of magnet have been carried out in his new instrument.

RÉMY (38) recommends a diploscope manufactured according to his plans by E. Venchat, of Paris. Its purpose is to discover the rôle of each eye in binocular vision (one eye—Tscherning's "œil directeur"—being, as is well known, of more importance), to assist in determining the refraction in anisometropia, to discover the binocular vision of squint patients, and finally to determine the angle of the squint. The original paper must be consulted as to theory and practical application of the instrument.

BERGER.

In order to see objects in relief with one eye SCHMIDT-RIMPLER (39) has devised an instrument similar to a reversed Giraud-Teulon binocular ophthalmoscope. Two images the intraocular distance apart from each other are brought into one eye.

LANDOLT (40) rightly states that the technic of splitting the capsule, unlike that of making the corneal section, about which volumes have been written, has received relatively little attention. His flexible cystotome in the form of a small sharp sickle-shaped knife meets all the requirements and lacks all the disadvantages of other forms which on account of their narrowness cannot be made sufficiently sharp.

V. MITTELSTÄDT.

The direct object of this communication by POOLEY (41) is to show that he was the first to employ the magnetic needle for the purpose of determining the presence of iron or steel in the eye.

ALLING.



Sections IV.—VII. Reviewed by DR. ABELSDORFF, Berlin.

IV.—ANATOMY.

43. **Velhagen.** An unusual condition found in a retina stained by Golgi's method. *Graefe's Archiv*, liii., 3, p. 499.

44. **Berl.** Remarks on the relations of the visual tracts to the anterior corpora quadrigemina in the rabbit. *Arbeiten a. d. neurol. Institut a. d. Wiener Universität*, viii., 1902.

45. **Symens.** Microscopic findings in a myopic nasal conus. *Arch. f. Augenheilk.*, xlv., p. 336.

46. **Szili.** On the anatomy and embryology of the posterior layers of the iris, with special reference to the sphincter pupillæ muscle in man. *Graefe's Archiv*, liii., 3, p. 460.

47. **Herzog.** On the development of the intrinsic musculature of the eye. *Zeitschr. f. Augenheilk.*, vii., 1, p. 47, and vii., 2, p. 155.

48. **Stock.** A contribution to the question of a dilatator iridis. *Klin. Monatsbl. f. Augenheilk.*, xl., p. 57.

49. **Wölflin.** A clinical contribution to the subject of the structure of the iris. *Arch. f. Augenheilk.*, xlv., p. 1.

VELHAGEN (43) describes and pictures the retina of an ox stained by Golgi's method, in which the end nodules of the rods are continued uninterruptedly into the nerve fibres. Possibly this was an anomaly.

BERL (44), after removing the occipital region of rabbits on one side and killing them four weeks later, in order to study the location of the optic fibres in the anterior corpora quadrigemina, concluded that the termination of the cortex-corpus quadrigeminum tract, like the termination of the retina-corpus quadrigeminum tract, lay in the white layer beneath the superficial gray. The corpus quadrigeminum of the same side as the injury was alone degenerated.

In animals in which the eye of the same side was enucleated also, a partial crossing in the chiasm could be determined.

SYMENS (45) found in the region of the conus in a myopic eye an absence of the rods and cones and pigment epithelial. The choroid extended on the nasal side much deeper into the tissues of the optic nerve than on the temporal. On the nasal side there was no retraction of the lamina vitrea, but rather a supertraction.

SZILI'S (46) investigations, made on 15 embryos, several newborn infants, and adults, in v. Lenhossék's anatomical institute at Buda Pesth, led to important conclusions, of which the following may be mentioned :

The sphincter and dilatator pupillæ arise genetically from the



epithelial portion of the iris; the ciliary processes are formed not only in the ciliary region but also in the region of the primitive iris, from which they draw back about the fifth month.

At the beginning of the fourth month, the proton of the sphincter can be seen as a collection of cells within the epithelium, where it turns back upon itself, and from the seventh month the transformation of the anterior layer of epithelial cells into the dilatator can be followed. In the adult, the nucleated cellular portion, in combination with the contractile fibres, makes up the epithelial muscle cells of the dilatator. The dilatator is inserted at its pupillary end into the sphincter, while its ciliary fibres extend in part to the ligamentum and in part to the ciliary muscle.

HERZOG'S (47) preliminary report on the development of the intrinsic muscles is not in entire accord with that of Szili. The sphincter develops from an epithelial proliferation, at the anterior and inner portion of the epithelial layer, where it turns back upon itself. In the formation of the dilatator the pigment epithelial cells send out protoplasmic processes toward the pupil. These processes form a continuous muscular layer. The ciliary muscle is not developed from the epithelium of the secondary vesicle, but from mesodermic tissue.

STOCK (48) presents a drawing of the iris of a fish otter, in which sphincter and dilatator are so well developed that the existence of the latter as an unstriped muscle cannot be doubted.

WÖLFFLIN (49) remarks that there is a marked difference between brown and blue irides, in that the trabeculæ are more marked in the latter. The trabeculæ, in 10 % of all cases seen with the corneal microscope, show a broadening at the ciliary end in the form of a white nodule.

#### V.—PHYSIOLOGY.

50. **Borschke and Heschels.** On the after-images of moving objects. *Zeitschr. f. Psychol. u. Physiol. d. Sinnesorgane*, xxvii., p. 387.

51. **Feilchenfeld.** On the judgment of size in the visual field. *Graefes Archiv*, liii., 3, p. 401.

52. **Du Bois Reymond.** On subjective projection. *Zeitschr. f. Psych. u. Physiol. d. Sinnesorgane*, xxvii., p. 399.

53. **Colombo.** Experimental measurements of hemeralopia and of the retinal purple. *Ann. d'Ottalm.*, xxx., 8-9, 10-11, 12.

54. **Jackson.** Centring and decentring of lenses before the eye. *Ophth. Rec.*, 1902.

BORSCHKE and HESCHELES (50) came to the following conclu-

sions: 1. The rapidity of the after-image is directly proportional to that of the object observed when the movement of the latter is not too fast. 2. The rapidity of the movement of the after-image increases with the number of excitations to the time unit. 3. The perceptibility of the object accelerates the movement of the after-image.

FEILCHENFELD (51) used for the estimation of sizes with an unchanged point of fixation a cross placed in a frontal plane. The comparison of the length of the four arms was always correct in a small field, but when the angle was increased by approaching the cross to the eye, the nasal arm was overestimated. The author explains this error by the fact that the horizontal arm occupies the entire horizontal extent of the nasal field, but does not fill the more extensive temporal half. In the same way the upper arm is overestimated in the vertical direction.

When the direction of the gaze is altered—for example, when one is asked to divide a horizontal line, using one eye only, the temporal portion is overestimated.

R. DU BOIS REYMOND (52), in order to get an impression of the vision of animals with divergent lines of vision, placed a laterally inclined mirror before each eye. Naturally, however, objects at the side were projected straight forward, and rivalry of the two fields ensued, so that the conditions in no way resembled those in the lower animals.

COLOMBO'S (53) paper treats of the following questions: 1. Is the smallest amount of light perceptible by the normal eye a constant for a given eye with a uniform mode of measurement? 2. Is the smallest perceptible amount of light constant for a given visual angle? 3. When different normal eyes at the beginning of the examination have vision less than the maximum on account of insufficient light, and by increasing the illumination of the test types recognition under a smaller visual angle is obtained—does then the quantity of light necessary to increase vision from one visual angle to the next smaller stand in a constant relation to the light unit originally assumed?

These and other questions of a similar sort have been carefully studied, and the utmost pains taken with the measurements, but the results appear somewhat unsatisfactory, as it is apt to be the case when subjective experiments are long continued with a single individual.

KRANSTÖVER.

After a discussion of the effect of decentring spherical lenses,

JACKSON (54) presents a table showing the amount of prismatic effect, both horizontal and vertical, produced by the decentring of cylinders at any axis of obliquity. ALLING.

# VI.—REFRACTION AND ACCOMMODATION.

55. **Treutler.** Some remarks on the schematic eye. *Klin. Monatsbl. f. Augenheilk.*, xl., p. 211.

56. **Weiss.** On the spherical aberration of the eye. *Compt. rend. de l'académie d. sciences d. Paris*, Jan. 13, 1902.

57. **Neustätter.** On the course of the rays in skiascopy. A disproof of Heine's views. *Klin. Monatsbl. f. Augenheilk.*, xl., p. 143.

58. **Wolff.** On skiascopy therapy, skiascopic determination of refraction, and my electric skiaskopophthalmometer. *Zeitschr. f. Augenheilk.*, vii., 3, p. 213.

59. **Meyerhof, M.** On the increase of high myopia from under-correction for near. *Klin. Monatsbl. f. Augenheilk.*, xl., p. 200.

60. **Roscher.** Myopia statistics from Dr. Rückert's eye clinic at Zittau. A contribution to the subject of full correction. *Ibid.*, xl., p. 191.

61. **Schreiber.** How is myopia best corrected? *Ibid.*, p. 19.

62. **Bjerke.** On the alterations in refraction and acuteness of vision after removal of the lens. *Graefe's Archiv*, liii., 3, p. 511.

According to TREUTLER (55), the schematic eye, made without a lens, should be corrected with a + 10.5 D lens, with its posterior surface 13 mm from the apex of the cornea; secondly, the far point of that myopic eye which aphakic is emmetropic should be 67 mm before the cornea; and, thirdly, the schematic and emmetropic eye should be 23-24 mm long. These three conditions were proved on the schematic eyes of Helmholtz, Stadtfeldt, and Tscherning, and the values altered in accordance with the requirements of the foregoing modifications.

WEISS (56) calls attention to the following evidence of spherical aberration in the eye. When one looks toward the sky through a pinhole in a card, he sees in the centre a dark irregular spot, which disappears when one holds a diaphragm 2 mm in diameter immediately before the eye. BERGER.

NEUSTÄTTER (57) criticises Heine's scheme of the course of the ray in skiascopy, published in the *Klin. Monatsbl. f. Augenheilk.* He states that Roth has already shown in the same journal the applicability of the katopric law on the diffuse reflection from the fundus, points out the neglecting of the distance between observer and observed, and claims, among other things, as an



error in construction, that Heine has drawn his scheme as if from two separate points at an infinite distance the rays enter the eye parallel to the axial ray.

MEYERHOF'S (59) collection is taken from the material of Augstein, who under-corrects myopia 0.5-2. D for distance and 3.-4. D for near, and in high myopia rarely orders a lens stronger than 8. D. Among 61 cases of myopia of at least 0.5 D, and a period of observation of at least one year, the patients, with four exceptions, being under twenty, the relation of stationary to progressive cases was 31:30. The degree of myopia in these statistics did not seem to affect the progressiveness, since of the myopes of 10 D and over only half were progressive. On the other hand, it was evident that the progression is most marked in the school period, for among the markedly progressive cases 74 % were in children under fifteen.

ROSCHER (60) has collected the material observed by Rückert over a period of ten years. Of 40 cases of myopia which were fully or slightly under-corrected, 28 remained stationary, 8 progressed 1.-2. D, and 4 progressed 2.5-4. D. Of 18 under-corrected cases, only 2 were stationary, 5 slightly and 11 markedly progressive. The period of control and the age being similar in the corrected and the uncorrected cases, the results of under-correction appear very unfavorable.

SCHREIBER'S (61) tabulated observations show that the greatest increase in myopia takes place between the ages of seven and fourteen. For this period he recommends full correction of myopia of 1.25 or over, provided the patient can accommodate up to  $\frac{1}{4}$  m. In myopes of twenty years or older, who previously have not been fully corrected, he does not give the full correction, which usually is uncomfortable, and furthermore, myopia is apt to be stationary after this age.

BJERKE'S (62) computations and tables show that with equal refraction of eyes containing a lens the refraction after removal, as shown by clinical experience, may be different, dependent upon:

1. The different corneal refraction with increased myopia in the eye with a lens, the different refraction of the lens, and the removal of the anterior surface of the lens from the cornea.
2. The change in the distance of the anterior surface of the lens from the cornea of 0.5 mm with increasing refraction of the eye, lens, and cornea.



3. The change in refrangibility of the lens of 1.0 with increasing refraction of the eye with the lens, diminishing corneal refraction, and removal of the anterior pole of the lens from the cornea.

The clinical fact that eyes with different degrees of myopia may become emmetropic after removal of the lens cannot be explained by changes in corneal refraction and the increased distance between cornea and lens. The author assumes rather a change in diameter of the refracting surfaces of the lenses.

In conclusion the author presents a small table in regard to the increase of acuteness of vision through enlargement of the retinal image after removal of the lens in different refractions.

#### VII.—MUSCLES AND NERVES.

63. **Salomonsohn.** On unilateral innervation of the frontalis muscle in cases of bilateral oculomotor paralysis. A new ptosis glass. *Berliner klin. Wochenschr.*, 1901, p. 693.

64. **Loeser.** A peculiar combination of abducens paresis and hemianopsia with a contribution to the theory of the disturbance in ocular measurements in the hemianopic. *Arch. f. Augenheilk.*, xlv., 1, p. 39.

65. **Stanculeanu.** Two cases of paralysis of the superior oblique after radical treatment of frontal sinus inflammation. *Arch. d'ophth.*, xxii., 1, 32.

66. **Landolt, M.** A peculiarity in the symptoms of certain ocular paralysis. *Ibid.*, xxii., 1, p. 41.

67. **Koster.** Operative treatment of strabismus. *Tydschr. v. Geneesk.*, 1902, ii., No. 6.

68. **Meige and Feindel.** The treatment of tics by immobilization of the movements and movements of immobilization (Brissaud's method). *Presse méd.*, 1902, No. 22.

69. **Valude.** Rupture of the ligamentous extension of the internal rectus and the inferior rectus by traumatism; reparation. *Bull. de la soc. d'ophth. de Paris*, Feb. 7, 1902.

70. **Bär.** Reflex nystagmus. *Arch. f. Augenheilk.*, xlv., p. 5.

71. **Peters.** Is miner's nystagmus of labyrinthine origin? *Ibid.*, xlv., p. 301.

72. **Antonelli.** A point in the history of strabismus operations. *Arch. d'ophth.*, xxii., p. 45.

73. **Meyerhof.** On the history of the lid-closure reaction of the pupil. *Berliner klin. Wochenschr.*, No. 5, p. 20.

74. **Boas.** On the centre for reflex contraction of the pupil and on the location and nature of iridoplegia. *Münch. med. Wochenschr.*, No. 10, p. 406.

75. **Todd.** A secure advancement operation performed with the aid of a new tendon tucker. *Ophth. Rec.*, Feb., 1902.

SALOMONSOHN (63) observed, in a patient of forty-nine with bilateral oculomotor paralysis, a unilateral innervation of the frontalis muscle which relieved the right ptosis by raising the

brow. The innervation extended also to the facial nerve. The instrument for relieving the ptosis, a wire curved into a spring and fastened to the bow of the glasses, has already been described by A. Meyer in THESE ARCHIVES.

LOESER (64) observed in Oppenheim's polyclinic for neurology a patient with left homonymous hemianopsia and right paralysis of the abducens. When the gaze was directed straight forward there were no double images, since in fixation with the right eye the image going to the left adducted eye fell upon the blind nasal half of the retina. The over-estimation of a horizontal line on the side of the defect, as described by Liepmann and Kalmus, could not be demonstrated in this case. Since in uniocular examinations there was no difference in estimation by the right and the left eye with paralysis of the abducens, the author does not accept the explanation of kinetic disturbance in hemianopsia as suggested by the writers above and rather accepts the factor proposed by Feilchenfeld (earlier in this report)—namely, the form of the field of vision.

STANCULEANU (65) saw, in two cases of suppuration of the frontal sinus in which Kuhnt's radical operation was performed, a paralysis of the superior oblique and in one case of the internal rectus also, caused by disturbance of the pulley of the superior oblique in the operation. If the removal of the anterior wall of the sinus can lead to injury of the trochlea, the danger is even greater when the operation is undertaken through the orbit. [In neither method should the tendon of the superior oblique be severed. In the operation of Jansen the pulley of the superior oblique is detached with the periorbita from the superior orbital margin and is stitched to its former place with the orbital flap. In cases of small sinus the superior oblique need not be disturbed. I have not seen any permanent diplopia after Jansen's operation, which is excellent (see ARCH. OF OPHTH., vol. xxviii.).—H. K.]

LANDOLT (66) reports two cases in which the better seeing paralyzed eye performed fixation while the unparalyzed eye was deflected.

KOSTER (67) operates according to Arlt's method, but he regulates the effect by extending the lateral incision and thus gets a correction as high as  $25^{\circ}$ . Instead of making his incision perpendicular to the direction of the muscle, he makes it at an angle of  $45^{\circ}$  so that the muscle can retract farther.

Koster then describes a method of shortening the muscle. He makes a horizontal incision 1 *cm* long in the conjunctiva and in the middle of the tendon and the muscle and then separates the tendon from the sclera. Two double-armed sutures are then passed from outward inward through the muscle and through the episclera at the point of insertion of the tendon. After the tenotomy of the antagonist has been performed, the sutures are knotted and the conjunctiva sutured above. JITTA.

MEIGE and FEINDEL (68) recommend systematic exercises in the treatment of tic of the lids and nystagmus. In chronic blepharospasm, the patient is directed to keep the eyes closed for a time and then to keep them open. In cases of nystagmus, the head is mobilized and the eyes are directed toward particular objects in various directions, or the head is moved while the patient is directed to fixate the same objects constantly.

BERGER.

VALUDE (69) observed a patient in whom after a tearing injury of the lower lid a deviation of this eye up and out appeared, with corresponding double images. Valude assumed that there had been a rupture of the check ligament extending from the orbital margin to the muscle sheath, and attempted by capsular advancement to rectify the position of the eye. After two operations this was accomplished. BERGER.

BÄR (70) observed six cases in the University Clinic at Innsbruck in which irritation of the conjunctiva or cornea from inflammation or foreign body caused a horizontal nystagmus with hippus which passed off when the cause was removed. In all the cases there was hyperopia, with latent or manifest divergent strabismus in four and convergent strabismus in one.

The author concludes therefore that excitation of the fifth nerve may bring about nystagmus and more readily when the musculature per se is somewhat weakened. The reflex excitation travels from the peripheral termination of the trigeminus to the spinal terminal nucleus of the trigeminus root and from here through the dorsal longitudinal bundle to the oculomotor.

PETERS (71) would explain miner's nystagmus through the vestibular apparatus of the ear. The throwing back of the head and the turning up of the eyes produce a new condition of equilibrium. On returning from work with the head straight and the eye directed forward, the altered position of equilibrium causes



another distribution of the endolymph, and thus an excitation in the vestibular apparatus, which reflexly is transferred to the eye muscles. By throwing back the head to a mean acquired position of equilibrium the nystagmus can be prevented or decreased.

ANTONELLI (72) refutes the general idea that John Taylor (1738) first cured strabismus by tenotomy. Taylor's practice was to pass a suture through the bulbar conjunctiva near the insertion of the tendon, raise up a fold, and cut it off. Covering the other eye immediately with a plaster it demonstrated to the astonished spectators that the squinting eye now looked straight forward. Lecat saw through the deception and Taylor then informed him that he cut a nerve which innervated the muscle too strongly. Lecat on a certain occasion presented him with an anatomical preparation and asked him to demonstrate this nerve, at which Taylor saw himself exposed and acknowledged the trickery.

v. MITTELSTÄDT.

MEYERHOF (73) cites an observation of v. Graefe (*Graefe's Archiv*, vol. i., p. 318, 1854), from which it is clear that the newly discovered reaction of the pupil to closure of the lid was methodically observed by v. Graefe.

TODD'S (75) instrument has two prongs which when placed on either side of the muscle and allowed to cross produce a fold through which sutures can easily be passed.

ALLING.

Sections VIII-XII. Reviewed by DR. R. SCHWEIGGER,  
Berlin.

#### VIII.—LIDS.

76. **Knapp, H.** A case of adenoma of the Meibomian glands with a synopsis of what is known of that kind of tumor. *Trans. Amer. Ophth. Soc.*, 1901.

77. **Morax.** Necrosis and gangrene of the lids. *Ann. d'ocul.*, cxxvii., p. 43, and *Bull. de la soc. d'opht. de Paris*, Jan. 7, 1902.

78. **Grossetti and de Vincentiis.** Clinical and critical considerations regarding four further operations by Motais's method in congenital blepharoptosis. *Ann. di Ottalm.*, xxx., p. 7.

79. **Kuhnt.** On the value of lid formation by the transplantation of skin flaps without a pedicle. *Zeitschr. f. Augenheilk.*, vii., pp. 19 and 97.

80. **Sachs, M.** A contribution to operative ophthalmology; plastic operations on the lids. *Ibid.*, p. 44.

81. **Koenigshoeffer.** Elephantiasis lymphangiectatica and lymphangioma cavernosum of the lids. *Ophth. Klinik*, 1902, No. 1.



KNAPP'S (76) case presented a nodular tumor showing yellowish white through the skin of the upper lid. On everting the lid the whole mass was seen to be an aggregation of hypertrophied Meibomian glands. Parts of the tumor were excised at times but returned, and finally the whole mass with the tarsal portion of the upper lid was removed. The cornea was protected by paring the edges and uniting the outer half of the lower lid with the remains of the upper lid. Eight cases of a similar nature are cited.

ALLING.

On the basis of two observations of his own on non-fœtid necrosis of the lids from streptococcus infection and the previous literature of the subject, MORAX (77) recommends that the designation "necrosis" of the lids be applied to non-putrid losses of substance caused by streptococci or staphylococci, while "gangrene" of the lid should be used only to designate the tissue necrosis caused by the aërobic micro-organisms.

BERGER.

On the basis of four new cases of Motais's ptosis operation, GROSSETTI and VINCENTIUS (78) discuss the manner of function of the lid, which is solely dependent upon the function of the superior rectus, which is mechanically connected with the lid. The motility is complete when the line of gaze is elevated, and in looking directly forward the width of the palpebral aperture of the operated eye is normal. When with the eyebrow fixed by compression the patient attempts to open the eye wide no widening of the palpebral aperture is observed in the operated eye. The normal opening in looking straight forward thus depends solely upon the tone of the superior rectus and not at all upon the elevator of the upper lid. The authors believe that the lamellæ detached from the superior rectus and implanted at the margin of the lid preserve their musculo-tendinous character and do not undergo connective-tissue degeneration, from the fact that the muscle with the lapse of time loses nothing of its functional breadth on the eyeball nor of the elevation of the lid that occurs with its contraction.

KRAHNSTÖVER.

While for cases of ectropium with thin cicatricial tissue surrounding the bone the transplantation of skin instead of the use of pedunculated flaps is advocated by other authors, KUHN (79) prefers the former method as having many advantages. The latter often produces too thick and heavy lids with the appearance of ptosis or entropium. The transplantation of a large flap

after the method of Le Fort-Wolfe and the simpler method of grafting fine Thiersch flaps are equally successful in the author's hands. Naturally in every plastic operation the patient must not be suffering from dyscrasias, chronic suppurations, or diseases of the orbit or neighboring cavities, and the inflammatory shrinking must have been long at rest.

Because of the shrinking during the healing process Kuhnt makes the flap at least twice as large as the defect and pushes it under the healthy margin of the wound instead of suturing. The lid is held tense during the healing and it is cleared of all cicatricial masses. The flap is applied only after all bleeding has ceased, and if there is a prospect of secretion beneath it several holes are cut in it. After some time, massage helps the smoothing out of the scar. Kuhnt's results are illustrated in detail by tables and diagrams.

SACHS (80), in cases of cicatricial ectropium, uses a single large Thiersch flap removed with a curved lance. Only a gauze bandage is applied. The same flap is used by Sachs to line the orbit or to enlarge the conjunctival sac so that an artificial eye may be worn. In this operation he shifts the mucosa downward on the posterior surface of the lid and covers the orbital tissues from upper to lower cul-de-sac with flaps of epidermis.

#### IX.—LACHRYMAL APPARATUS.

82. **Forck.** Sarcoma of the lachrymal gland removed by Krönlein's method with a modification in technic. *N. Y. med. Wochenschr.*, Jan., 1902.

83. **Dalén.** A case of bilateral congenital fistula of the lachrymal sac. *Hygiea*, Feb., 1902.

84. **Caspar.** Diphtheritic gangrene of the lachrymal sac. *Centralbl. f. Augenheilk.*, xxvi., 3, p. 83.

85. **Bettremieux.** The neuralgia of persons having lachrymation. (Lesions of the lachrymo-nasal mucosa considered in their relations to facial neuralgias and tics). *Bull. de la soc. belge d'opht.*, Nov. 24, 1901.

86. **Mittendorf.** Dislocation of the lachrymal gland. *Trans. Amer. Ophth. Soc.*, 1901.

DALÉN'S (83) case was in a girl of six. On both sides, 4 mm medial and a little below the internal canthi, there were small round fistulous openings, through which a clear liquid exuded, taking on a green color when fluorescein was dropped into the conjunctival sac. The nasal duct was permeable on each side. There were no evidences of previous inflammation and the con-

dition was doubtless congenital. The author refers to previously described cases of this sort and discusses briefly the probable manner of their development.

#### X.—ORBIT.

87. **Laas.** A case of bilateral orbital phlegmon with recovery and preservation of vision in both eyes. *Zeitschr. f. Augenheilk.*, vii., p. 179.

88. **Goldzieher.** A contribution to the subject of symmetrical tumors of the orbit. *Ibid.*, p. 9.

89. **Goldzieher.** Orbital syphilis. *Magyar Orvosok Lapja*, 1902.

90. **Köhler.** Osteoma of the superior wall of the orbit. *Deutsche med. Wochenschr.*, Vereinsbeil. 24, p. 184.

91. **Kalt.** Orbital cysts with vegetating walls and of sudden development. *Ann. d'ocul.*, Jan., 1902.

LAAS (87) observed in a young man, after a furuncle at the root of the nose, with œdema of the lids on both sides, an exophthalmus of the right eye appearing two weeks later, with marked general disturbances and later exophthalmus of the left eye.

The condition was complicated with high temperature, diminished frequency of the pulse, vomiting, headache, and bleeding from the nose. In the right eye there was a typical choked disc, and there were many abscesses about the eye. Particularly unusual were light yellow spots within the eye that suggested tumor and detachment of the retina, which were taken to be subchoroidal exudations. The epibulbar abscess scars caused an astigmatism and the orbital changes a strabismus.

GOLDZIEHER (88) reported a peculiar case of symmetrical tumor formation in the orbit. A girl of sixteen, a virgin, had a large fibrosarcoma removed from one orbit, and a month later both eyes were protruding from new formations in the orbit which could not be extirpated cleanly and appeared to be a pure cicatricial tissue poor in cells.

The protrusion of the ball increased and the patient died of pneumonia. The same tissue that filled the orbit and there in places exhibited bony structure was found also in the liver and spleen, on the top of the skull, and in the tissues before the spinal column. The author did not believe this to be sarcomatous, but rather a chronic inflammatory product, such as constitutional syphilis causes.

#### XI.—CONJUNCTIVA.

92. **Morax.** The differentiation between granular and acute infectious conjunctivitis. *Ann. d'ocul.*, cxxviii., p. 199.



93. **De Wecker.** The transmission of trachoma in Egypt. An open letter addressed to Messrs. Morax and Lakah. *Ibid.*, p. 54.
94. **Von Arlt, F. R.** On the use of cuprum citricum in trachoma. Preliminary report. *Centralbl. f. Augenheilk.*, xxvi., 3, p. 80.
95. **Goldzieher.** A contribution to the therapy of trachoma. *Wiener med. Wochenschr.*, No. 9, 1902.
96. **Werschbitzky.** The treatment of trachoma with ichthyol. *Wojenno Med. Journ.*, 1901, xi.
97. **Mrongovius.** The treatment of trachoma with ichthargan. *Ibid.*, 1902, iii.
98. **Bassalino.** Primary tuberculosis of the bulbar conjunctiva. *Ann. di Ottalm.*, xxx., 7.
99. **De Berardinis.** Tuberculosis of the conjunctiva. *Ibid.*
100. **Valude and Morax.** Bilateral lymphoid infiltration of the retro-tarsal folds. *Ann. d'ocul.*, cxxvii., p. 190.
101. **Morax.** A case of dermo-epithelioma of the conjunctiva. *Bull. de la soc. d'opht. de Paris*, Feb. 4, 1902.
102. **Schapringer.** A clinical contribution to congenital "Schurze" of the conjunctiva. *Zeitschr. f. Augenheilk.*, vii., p. 53.
103. **Suker.** A separate gumma of the caruncle and ocular conjunctiva. Report of a case with a complete bibliography appertaining thereto. *Amer. Journ. of Ophth.*, March, 1902.
104. **Wadsworth and Verhoeff.** A case of melanotic giant-cell sarcoma of the limbus associated with an implanted secondary growth on the lower lid. *Trans. Amer. Ophth. Soc.*, 1901.
105. **Hepburn.** Hunterian chancre of the caruncle. Right eye. *Ibid.*
106. **Andrade.** A case of ophthalmia neonatorum caused by the diplobacillus of Morax and Axenfeld. *Amer. Journ. Med. Sciences*, Feb., 1902.
107. **Steiner.** On trachomatous spots in the Malay. *Annals of Ophth.*, Jan., 1902.

MORAX (92) calls attention to the frequency of mixed infections of the conjunctiva. The frequent epidemics described by ophthalmologists in Egypt as acute epidemics of trachoma with corneal ulcers are to be regarded as acute conjunctival inflammations in the trachomatous. The added acute affection is usually due to the Weeks bacillus and occasionally by the gonococcus. Lakah and Khouri have shown that the number of cases of blennorrhœa in the trachomatous is increased in the months of July and August. BERGER.

In cases of trachoma without profuse secretion, ARLT (94) dusts in citrate of copper mixed with sugar 1:10 or 1:20 or even unmixed, and also rubs in a 5-10 % salve (glycerine with starch) with which massage is performed for half a minute two or three times a day. The action is as great as that of sulphate of copper without being painful. Trachomatous pannus is quickly improved.



Corneal ulcers and any iodine treatment contra-indicate the use of the citrate.

GOLDZIEHER (95) seeks to cure trachoma in its incipient stages by surgical measures. The old trachoma therapy—the indiscriminate use of copper—was responsible for the habitual condition of irritation, the traumatic keratitis and pannus, the shrinking of the tarsus, and the like. When there is no secretion he employs surgical procedures: with slight infiltration the galvano-cautery is sometimes sufficient; with dense granulations and infiltration of the entire tarsus he uses expression with Knapp's roller forceps, in general anæsthesia or after injecting 3-4% cocaine or eucain solution beneath the retrotarsal folds. Extensive pannus he treats with the galvano-cautery.

WERSCHBITZKY (96) from his experiments draws the following conclusions: 1. Ichthyol cures trachoma of the first and second degree in 2-5 weeks. 2. In trachoma of the third degree there is recovery without resort to surgical means in half the cases in 3-8 weeks. 3. In trachoma of the fourth degree ichthyol has little value. 4. The disadvantage of ichthyol is the severe burning pain that it causes.

HIRSCHMANN.

MRONGOVIVUS (97) finds that 4% ichthargan does not affect the healthy cornea. The expression of the granulations and the use of 2-3% solution of ichthargan cures trachoma in 1½-3 weeks.

HIRSCHMANN.

VALUDE and MORAX (100) observed in a man of fifty-six the formation of a lymphoma in the retrotarsal folds of both eyes without swelling of the lymph glands.

BERGER.

STEINER (107) describes a peculiar discoloration of the conjunctiva of the upper lid in trachoma of the Malay. It occurs in the form of an irregular network of black dots and lines or as a more or less regular black patch. Microscopic examination shows the pigment to be in the lowest stratum of the epithelium, mostly in the epithelial cells.

ALLING.

## XII.—CORNEA.

108. **Fuchs.** On nodular opacities of the cornea. *Arch. f. Ophth.*, liii., 3.

109. **Le Gentil.** Parenchymatous keratitis and deafness. *Thèse de Paris*, 1902.

110. **Zirm.** A contribution to the treatment of hypopyon keratitis. *Centralbl. f. Augenheilk.*, xxvi., 3, p. 77.

111. **Handmann.** On the treatment of rodent ulcer of the cornea. *Klin. Monatsbl. f. Augenheilk.*, xl., p. 221.
112. **Hoppe.** First help for lime injuries of the eyes. *Centralbl. f. Augenheilk.*, Feb., 1902.
113. **Guillery.** On calcium opacities of the cornea and a procedure for clearing them up. *Arch. f. Augenheilk.*, xlv., 4, p. 310.
114. **Noiczewski.** A case of radical cure of keratoconus by operative means (keratectomy). *Centralbl. f. Augenheilk.* Feb., 1902.
115. **Badel.** Three cases of keratoconus (immediate and remote results of surgical intervention). *Gaz. heb'd. d. sciences méd. de Bordeaux*, Sept. 15, 1901.
116. **Voltz.** On the colloid degeneration of corneal scars. *Inaug. Dissert.*, Freiburg-i.-Br., 1902.
117. **Sachs, M.** Contributions to operative ophthalmology. On the loosening of anterior synechias after trephining of the cornea. *Zeitschr. f. Augenheilk.*, vii., 1, p. 37.
118. **Panas.** Epibulbar tumors of the sclero-corneal limbus. *Arch. d'opht.*, xxii., 1, p. 1.
119. **Fumagalli.** Primary angiosarcoma (perithelioma) of the cornea developing in an old scar. *Klin. Monatsbl. f. Augenheilk.*, xl., p. 38.
120. **Utermöhlen.** On scleritis, based on two cases of cycloscleritis. *Dissertation*, Amsterdam, 1902.
121. **Feilchenfeld.** Rheumatic sclerokeratitis, specific subacute cyclitis following a traumatic ulcer of the cornea. *Centralbl. f. Augenheilk.*, 1902, p. 5.
122. **Stoewer.** Subconjunctival perforation of the sclera by a dart. *Zeitschr. f. Augenheilk.*, vii., p. 217.
123. **De Schweinitz.** Relapsing traumatic bullous keratitis with cases. *Ophth. Record*, Feb., 1902.
124. **Gruening.** A case of sclero-corneal cyst. *Trans. Amer. Ophth. Soc.*, 1901.

The eight cases examined by FUCHS (108), which he regards as similar to those described by Groenouw and compares with the grill-shaped keratitis, began with mild inflammatory symptoms and were characterized by: 1. Marked unevenness of the cornea. 2. Gray, mostly round patches in the pupillary area, superficial and even elevated above the level of the cornea. 3. A diffuse opacity of the cornea which appears under the loupe finely stippled. The spots change in the course of years and mostly increase. Abrasion of the cornea led to improvement. Trephining with the object of transplantation furnished material for microscopic study. The superficial corneal lamellæ were swollen and at some points frayed out, and pervaded with an amorphous substance. The subjacent lamellæ showed altered staining qualities with thionin. No Bowman's membrane was discoverable; inflammatory signs were wanting. In regard to

the etiology, experiments on animals with similar corneal changes pointed to thyroid changes.

ZIRM (110) writes again of the method of treating hypopyon keratitis that he has used since 1899. He uses bichloride vaselin 0.01-50 and xeroform once daily. The galvano-cautery is used freely, and the cornea is often perforated. The tear sac is washed out with protargol. Besides, he uses atropine or scopolamin, warm fomentations, and subconjunctival injections of 10 per cent. salt solution. Dionin has given him remarkable results.

In a man of twenty-four, STOLTING and HANDMANN (111) transplanted a double pedunculated conjunctival flap over a rodent ulcer of the cornea, but it healed nowhere, and in the course of nine months the ulcer spread over the entire cornea, then the process ceased, leaving a diffuse opacity with  $V = \frac{10}{200}$ .

In a second case the floor and undermined edge of the ulcer were touched every second day for three weeks with tincture of iodine. This prevented the painful progressions of the ulcer, the eye became free from irritation, and a milky white scar remained in which the corneal tissue was greatly thinned, but did not bulge forward.  $V = \frac{5}{4}$ .

HOPPE (112) recommends that in cases of fresh lime burns of the eye a thin lanolin salve with 2 % holocain in a tube should be squeezed into the eye. This relieves the pain and prepares the eye for the attentions of the physician.

The primary opacities of the cornea which appear after lime burns and are to be differentiated from the later results of the injury, inflammation, or ulcer, are believed by GUILLERY (113), like Andreae, to be organic combinations—namely, albuminate of calcium, whose solubility in salmiac Guillery demonstrated in a test tube and in living rabbits. Experiments on the living with old opacities showed that eye baths of 20 % salmiac could be borne without discomfort. The opacities cleared in a marked manner. Guillery will experiment with the cataphoric effect of the constant current.

FUMAGALLI (119) designates his case as the only reliably diagnosed case of primary sarcoma of the cornea. It had developed from a seven-year-old scar from an injury and rested broad and fungus-shaped upon the entire cornea.

UTERMÖHLEN (120) has advanced the question whether scleritis is to be regarded as a primary or a secondary affection.



He comes to the following conclusions after the pathological examination of two eyeballs enucleated for "scleritis" and a series of clinical observations:

1. There is no reason for distinguishing a clinical picture of episcleritis from scleritis, except in cases of Fuchs's episcleritis periodica fugax.

2. Attacks of scleritis which develop together with an inflammatory swelling of the episcleral tissue (Schlodtmann) are of a particular clinical type and may be designated "sclero-episcleritis."

3. On practical grounds at present simple scleritis must be differentiated from sclerocyclitis.

4. Pathologically the independent existence of simple scleritis has not been proven.

5. At times scleritis is the result of tuberculous infection, but this probably is true in but a small number of cases. JITTA.

FEILCHENFELD (121) treated a case of deep marginal keratitis with a crescentic infiltration at the upper limbus, with atropine, mercurial salve, and moist dressings, for a time. The ulceration increased, however, and was not held in check by the galvano-cautery. Finally it was cured by diaphoretic treatment which was ordered in view of rheumatic pains.

In his second case Feilchenfeld undertook the management of a corneal ulcer which had been treated with medicaments and mechanically for three weeks, having been caused by a trauma. In the other eye there was cyclitis, which led to a general examination of the body and the discovery of syphilis. With a simple bandage and treatment by inunction there was recovery in two weeks.

STÖWER'S (122) patient while looking down was struck by a dart from a blow gun, which passed through the upper lid into the sclera anterior to the equator. There was some prolapse of vitreous and also chemosis of the conjunctiva. The scleral perforation was sutured, the tension arose to the normal, and the acuteness and field of vision became normal.

A cyst-like growth forming an elevation encircling three-fourths of the cornea, encroaching upon it and extending into the adjoining sclera, is described by GRUENING (124). The mass measured 8 mm in height and 10 mm in width and resembled an inflated intestine. It did not communicate with the anterior chamber.

ALING.



Sections XIII-XVIII. Reviewed by DR. O. BRECHT, Berlin.

### XIII.-LENS.

125. **Lezenius.** A case of naphthalin cataract. *Klin. Monatsbl. f. Augenheilk.*, xl., p. 129.

126. **Hirschberg.** An unusual cataract operation. *Deutsche med. Wochenschr.*, xxviii., p. 217.

127. **Becker, Adolf.** The relation of cataract to struma. *Inaug. Dissert.*, Giessen, 1902.

128. **von Hippel, E.** On spontaneous rupture of the lens capsule and expulsion of the nucleus from the eye. *Beitr. z. Augenheilk.*, xlix., p. 74.

129. **Blumenthal.** On the prevention and treatment of secondary cataract. *Report of the Ophth. Section of the VIII. Pirogoff Congress at Moscow*, Jan. 4-10, 1902.

130. **Grab.** On changes in the location of the lens in their etiological and therapeutic aspects. *Inaug. Dissert.*, Zurich, 1901.

131. **Tyschnenko.** Clinical reports of traumatic luxation of the lens. *Wojenno Med. Journ.*, ii., 1902.

132. **Wanner.** Subconjunctival injections in infectious processes after cataract operations. *Inaug. Dissert.*, Tübingen, 1902.

LEZENIUS (125) observed a case of naphthalin cataract in an otherwise healthy man who for a stomach disturbance took of an emulsion of naphthalin non-depur., 5:200 ol. ricini, within 13 hours, and 8-9 hours later was almost entirely blind. V = fingers at 1.5 m each; concentric contraction of the fields. In the lens, in the form of lamellar cataract, numerous sharply outlined opacities of various forms with a diffuse delicate grayish cloudiness between them. The retina was pale and cloudy, the vessels narrow, the temporal half of the disc pale, and there was a small light-red spot in the left macula. The author warns against the use of unpurified naphthalin.

HIRSCHBERG (126) attempted to couch a cataract in an idiot of thirty-six, extraction in narcosis not being deemed advisable, but on account of the softness of the lens the attempt was unsuccessful. He was able, however, to cut out the inner-upper fifth of the lens, and later the entire lens shrunk, giving the effect of a discission.

BECKER (127) from his observations concludes that a relationship between cataract and struma has not been proven, and that cataract with goitre is most probably due to an auto-intoxication.

VON HIPPEL (128) adds a note to Meller's paper, stating that in his paper published in *Graefe's Arch.*, xl., 1, on siderosis

bulbi, he had described rupture of the anterior capsule of the lens, without discussing the significance of this occurrence.

BLUMENTHAL (129) recommends for preventing secondary cataract after the extraction of senile cataract a careful removal of the cortical masses, particularly when there is insufficient mydriasis, since these masses irritate the iris and cause dense complicated secondary cataracts. The operation for uncomplicated secondary cataract is never an urgent one. The author operated from above, without a speculum, with a double-edged needle. For extraction he has modified the pince-ciseaux.

GRAB (130) gives a statistical report of the cases of luxation of the lens seen in the Zurich Clinic since 1862 and those seen by Prof. Haab in his private practice. He divides them into: (1) ectopia lentis, 18 cases, or 56.8 %; (2) luxatio lentis spontanea, 36 cases, or 28.8 %; (3) luxatio lentis traumatica, 71 cases, or 56.8 %. By ectopia he means cases in which the congenitally displaced lens still is fixed fast in its supporting apparatus.

The causes of spontaneous luxation are for the most part high myopia, cyclitis, choroiditis, shrunken traumatic cataract, etc. In ectopia one tries glasses or resorts to discission. The fate of eyes with dislocated lenses is usually a sad one. Discission is indicated in subluxation of low degree. In complete luxation without complications one waits, but if complications arise extraction should be attempted. In traumatic luxation with healthy vitreous extraction is recommended, in spontaneous luxation and liquid vitreous couching may be done. A lens luxated into the anterior chamber should be extracted.

WANNER (132), after an experience of 12 cases, recommends subconjunctival injections of silver or mercurial preparations particularly in purulent processes after cataract extraction. Salt hastens absorption in the anterior and vitreous chambers. Injections of bichloride doubtless have an antiseptic effect, but also many unpleasant after-effects, such as pain, long-continued hyperæsthesia, chemical action upon the conjunctiva, and obliteration of the subconjunctival lymph spaces.

#### XIV.—IRIS.

133. **Schrecker.** On tuberculosis of the iris. *Inaug. Dissert.*, Berlin, 1902.

134. **van Duyse.** Persistent pupillary membrane adhering to the cornea. *Bull. de la soc. belge d'opht.*, Nov. 24, 1901.

135. **Snell, A. C.** A report of a case of dermoid cyst of the iris not preceded by trauma. *Annals of Ophth.*, Jan., 1902.
136. **Gruening.** Sarcoma of the iris. *Trans. Amer. Ophth. Soc.*, 1901.
137. **Alt.** A case of traumatic retroflexion of the iris, anatomically examined. *Amer. Journ. of Ophth.*, Jan., 1902.
138. **Hepburn.** Primary tuberculosis of the iris. *Trans. Amer. Ophth. Soc.*, 1901.
139. **Bogoslowsky.** A case of cyclopia cyclencephalia. *Protocollé des Cherson'schen Aerztlichen Vereins*, 1900-1901.

SCHRECKER (133) describes a case of tuberculosis of the iris which showed the tubercle form in an extraordinary characteristic way. He discusses in detail the differential diagnosis, prognosis, and therapy of this disease. At first general measures are undertaken; in case of doubt inunctions are employed, in proper cases iridectomy. If the eye is in great danger tuberculin injections should be used. The final resort is enucleation.

SNELL (135) reports the case of a woman thirty-four years of age who, about five years before, had observed a small yellow spot on the iris, which gradually increased in size. Apparently growing from the iris and incorporated in it was an oval pearly white mass, 6 mm by 4 mm. Two hairs were projecting from the tumor. The eye was blind and painful from secondary glaucoma and was enucleated. The author believes the case to be of congenital origin.

ALLING.

The peculiarity in BOGOSLAWSKY'S (139) case was a double pupil. The monster came from a family of degenerates.

HIRSCHMANN.

(To be continued.)

## BOOK REVIEWS.

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**I.—A Treatise on Diseases of the Eye, Nose, Throat, and Ear.** For Students and Practitioners. By various authors. Edited by W. C. POSEY, A.B., M.D., Philadelphia, and JONATHAN WRIGHT, M.D., Laryngologist to the Brooklyn and Manhattan Eye and Ear Hospitals. Cloth \$7. Leather \$8. 1902. Philadelphia: Lea Brothers & Co.

A large, heavy—15 pounds—volume of 1238 glazed pages, far from pleasing to the sense-organ of sight which occupies more space than the three other sense-organs together. There have been 28 authors at work (the name of the second editor is omitted in the list), among them 4 Englishmen and 1 Canadian. Whether there was such an urgent need to “produce a work that should treat these cognate specialties from the standpoint of the highest authority” (publishers’ circular), after the *American Textbook of Diseases of the Eye, Ear, Throat, and Nose* (60 authors), edited by De Schweinitz and Randall, 1899, has had a sale of  $x$  thousand copies, must be left to the responsibility of the publishers from whom “Drs. Posey and Wright accepted the joint editorship.” As to the price, the publishers state that “the production of an entirely new and original volume of nearly 1250 pages, with 650 engravings, and 35 inset plates, largely in colors, and to price it at \$7 in cloth is a phenomenal undertaking in the manufacture of medical books.” When we peruse this volume as to its intrinsic value, we are glad to confess that it is very great. We have gone over the ophthalmological part, which alone would appeal to the readers of these ARCHIVES, and have found in it a great deal of lucid presentation and accurate practical instruction. Here and there we might wish that the descriptions were shorter and somewhat more precise, the plates truer to nature, and the inset colored plates less appalling (look at Plate XIII., facing p. 347). Colored Plate I., facing page 23, illustrating an exceedingly common and long-known subject, says, on page 24, “conjunctival congestion is diagnostic of conjunctivitis” (Plate I., Fig. 2). The Reviewer believes if he had to make the diagnosis of Figure 2, he would say at once—iritis.

Chapter I., by Dr. W. C. POSEY, is “On the Examination of the Eye,” 52 pages, containing the usual description in a satisfactory manner.



Chapter II., pp. 53-74, by W. N. SUTER, "On the Physiology of Vision," is very good, showing that the author is no mere copyist.

Chapter III.—"Refractive Errors in General." By A. DUANE. A very good and concise exposition of this rather difficult subject. The author is celebrated for his learning and accuracy, yet there is a popular mistake in the theory of astigmatic refraction, page 76, line 7 from below. "Instead of there being one principal focus for all meridians . . . there are a number of foci, one for each meridian, and these foci lie one behind the other." This, in astigmatic refraction, is not exact, plausible though it appear. There are only two meridians whose refracted rays unite in a focus, the two principal ones, whereas all the others have no foci, none of their rays crossing any other. Sturm, a French physicist, determined mathematically the peculiar form of the pencil of the refracted rays when a homocentric pencil passes through one or several indifferently curved, non-spherical surfaces of separation (*Poggendorff's Annalen*, Bd. 65, 1845). The surface of the cornea comes nearest to a triaxial ellipsoid.

This—not strictly correct—supposition that the intermediate meridians have foci between those of the principal meridians, used here and there in the continuance of Dr. Duane's article, has no influence on the results of the deductions, as only the principal meridians are of account. The article of Duane is excellent.

Chapter IV.—"Motions of the Eye." By Dr. CASEY A. WOOD. Pp. 145-191. Treats of the normal motions and all their errors—insufficiency, strabismus, paralysis; their diagnosis and treatment, optical and operative. It is up to the newest American standpoint with appreciation of European views and methods.

Chapter V.—"Orbit, Lachrymal Apparatus, and Lids." By Dr. R. A. REEVE. Pp. 192-257. There are also a few pages on "Diseases of the Accessory Sinuses." The article makes a judicious selection among the multitude of operations on the lids, with the illustrations to be seen in every textbook.

Chapter VI.—"Diseases of the Conjunctiva, Cornea, and Sclera." Pp. 258-330. By Dr. JOHN E. WEEKS. A fair description of these important diseases, with a number of illustrations, mostly copied. Conjunctivitis is divided into simple and bacterial—as far as the etiological factor has not been or has been determined, viz., simple conjunctivitis, lachrymal conjunctivitis (the Reviewer thinks that this is contagious and for wounds or ulcers of the cornea very dangerous), vernal conjunctivitis, conjunctivitis

folliculosa simplex, trachoma or granular conjunctivitis; the forms in which the etiological factor has been determined—acute contagious conjunctivitis (pink eye), caused by a small bacillus (Koch-Weeks), also produced by the pneumococcus (Gifford and others), gonococcus, diphtheria bacillus, etc.

Chapter VII.—“Embryology of the Eye. Diseases of the Uveal Tract and Vitreous.” By H. V. WÜRDEMAN. This is quite an interesting chapter.

Chapter VIII.—“Sympathetic Ophthalmia.” By H. GIFFORD. Pp. 390–416. Foreign bodies: their extraction, symptoms, and course. Theories. Treatment: neurectomy, enucleation, artificial vitreous, prothesis.

Chapter IX.—“Retina; Optic Nerve and its Cerebral Origin.” By T. HOLMES SPICER, F.R.C.S. Pp. 417–472. A very good article. The earlier and the later (Golgi and Ramón y Cajal) anatomy of the retina, its vascular affections, and their consequences are duly considered. The optic nerve is traced with singular clearness and completeness from the retina (with reference to the visual field), through the orbit and along its winding path to the primary ganglia, the optic radiation, the perceptive centre, the memory centre, the speech and motor centres, with their communications in one and both hemispheres, together with their functional significance, pathological importance, and localizing value. He states, however, that the course of the visual fibres from the external geniculate bodies to the optic radiation is not yet known (p. 470). Lesions of the posterior part of the posterior limb of the internal capsule are reported to have been followed by homonymous hemianopsia, which is supplemented, however, by Henschen, who says that in such cases the external geniculate bodies or the optic tract are always interfered with at the same time. Word blindness, ataxia, agraphia, dyslexia, amnesic color blindness, visual hallucinations, mind blindness. Concerning the singular phenomenon that in bilateral homonymous hemianopsia the region of the macula lutea of either eye does not lose its function, he mentions the two explanations: *a*, the increased blood supply; and *b*, the representation of each macula lutea in the visual centre of each eye. Ferrier's view of crossed amblyopia, by the existence of a higher visual centre in the angular gyrus, in which the presentation of the macular region of the opposite eye was greater than that of the same side, is, for man at least, disbelieved by most authors.

Chapter X.—“Diseases of the Crystalline Body.” By E. C. ELLETT. With a good many original microscopic drawings of diseased lenses by E. S. Thompson of the laboratory of the Manhattan Eye and Ear Hospital; otherwise very elementary.

Chapter XI.—“Glaucoma.” By TREACHER COLLINS, F.R.C.S., England. Anatomical details; theories of glaucoma. Pathological investigations, with original drawings. Prognosis. Treatment. Very instructive and convincing article. Jonnesco advances in the report of eight cases, among other statements, these results: disappearance of the attacks of irritative glaucoma, considerable permanent improvement of vision in all cases in which complete atrophy of the optic nerve had not set in. The author adds: “In other surgeons’ hands, though the operation has sometimes been attended with success, disastrous results have also occurred. Some patients have died as the result of the operation. Increased tension, though reduced for a time, has returned in some cases. Symptoms of tachycardia and exophthalmus have developed.” (See page 563, at the end.)

Chapter XII.—“Disturbances of Vision without Apparent Lesion.” By E. G. STARR. Short, but very readable.

Chapter XIII.—“The Eye in Relation to General Diseases.” By C. F. CLARK. Pp. 583-652. Very useful.

Chapter XIV.—“General Preparation for Operations on the Eye.” By CLARENCE A. VEASEY.

Chapter XV.—“The Technique of the Pathological and Bacteriological Examination of the Eye.” By EDW. A. SHUMWAY. A well written article, essential to the eye surgeon that wants to base his diagnosis and treatment on scientific methods and matured conclusions.

As the reader will see from these excerpts, there is a good deal of new and valuable material in this weighty book. If I were asked by the numerous possessors of the *American Text-book of the Eye, Ear, Nose, and Throat*, by De Schweinitz and Randall (1899), whether it would not be better to go over this work a second time than to read its new companion edited, and well edited (1902), by Posey and Wright at the bidding of another great Philadelphia book-producing firm, I would say, at first, “I know not;” secondly, “Do as I have done”: take the new book, read it, compare it with the other, and if you possess the precious gift of concentration of mind,—in plainer English, attentive reading—the gain will be a hundred times greater than the expense.

H. K.



II.—**Die Motilitätsstörungen des Auges**, von Dr. ERNEST E. MADDOX. Translated into German by Dr. W. ASHER, Leipzig, 1902.

Maddox's book, distinguished by its simplicity and directness, is particularly valuable to the beginner in this department, which has been made unnecessarily difficult by the introduction of a large number of pointless subtleties. The German translator has not spoiled its easy perspicuity. The anatomy and physiology of the muscular apparatus are chiefly taken from French and German literature, with no new views as far as we could find, but the secured stock of knowledge is faithfully presented, and credited to the proper sources.

The author, to increase the effect, recommends stretching of the soft cicatrix with a squint hook one or more days after the operation.

In case the deviating eye in strabismus makes no accommodative adduction on moving the finger near the root of the nose, a tenotomy of the external rectus is without any effect. Advancement is here indicated.

Stress is laid on the post-operative optical treatment.

The palsies of the ocular muscles occupy sixty-four pages. The drawings and circumstantial rules in diagnosis of our student-years are reproduced. A great deal of mnemotechnique is given for the benefit of the learner. One rule includes almost all that is required: "Learn the physiological function of each muscle, and remember that the double-image repeats in position, motion, and wheeling the normal function of the non-paralyzed muscle; for instance, the superior oblique moves the cornea down and out, and wheels [turns the upper end of] the vertical meridian inward. The double-image is lower, homonymous, and turned with the upper end nasally." The student need not speak in a whisper when he has such a case before him. Of course, he must know his anatomy and physiology. The analysis of an old case of ocular paralysis is often extremely difficult, but nobody is required to unravel hopelessly entangled conditions anywhere. There is a great deal of interesting detail in the ocular palsies which will interest any searching mind.

The rest of the book, one hundred and three pages, is occupied by descriptions of the modern methods of examination and treatment in the lesser degrees of disturbances of motility such as they have been brought forward, chiefly by American investigators—Stevens, Risley, Prince, Jackson, Duane, Swan Burnett, Morton, Savage; in England, by Maddox himself, Priestley Smith, Berry; in France, Javal, Landolt, Panas; in Germany, Listing Ruete,



A. v. Graefe, Albrecht Graefe, Hering; in Holland, Donders and Snellen; in Sweden, Gullstrand.

This book will be extensively read.

H. K.

III.—**Chirurgie de l'Œil et de ces Annexes.** By Dr. F. TERRIEN, formerly Chief of the Ophthalmological Clinic in the Paris Faculty. 311 figures in the text. 432 pp. Published by G. Steinheil, 2 rue Casimir-Delaigne, 1902. Price, 15 francs.

In the *Traité de Médecine Opératoire* of Berger and Hartmann, the operations on the eye are treated by Dr. F. Terrien, formerly Professor Panas's Chief of Clinic at the Hôtel-Dieu. This volume is published separately and is gotten up in quite an elaborate manner. The subject-matter is very explicit; the indications, technique, and complications of the various operations are fully given. We find the views and teachings of Panas frequently reproduced. The illustrations are quite a feature, being unusually large, clear, and generally correct. The drawings for the excellent Panas's entropion operation are misleading, as the section of the tarsus should be made nearer the inferior border than is given in the sketch; it should correspond to the cicatricial groove on the inner surface of the tarsus.

The subject of cataract is exhaustively treated. Simple extraction is recommended as the method of choice. In secondary cataract, if the capsule be thick and resisting it should, according to the author, be extracted after five or six months with the Liebreich-Panas forceps. Ordinarily no or slight loss of vitreous follows. In youthful cataracts discission is abandoned for linear extraction. In diabetic cataract he advises always to perform the combined extraction. Enucleation is not thought necessary in the treatment of the malignant conjunctival epibulbar tumors. In the treatment of strabismus, both eyes should be operated upon, either by double tenotomy or double advancement of the antagonists.

In addition to the purely surgical affections some of the usual inflammations are described, and of these we should like to mention the excellent chapter on conjunctival inflammations. These are discussed from the modern bacteriological standpoint. A bacterial examination of the secretion should be made, and on the authority of Morax it is stated that the cover-glass examination is sufficient and more reliable than cultures.

The book is excellent and has been most carefully written. The make-up and wealth of illustration testify to a very commendable liberality on the publisher's part.

A. K.





1.



2.

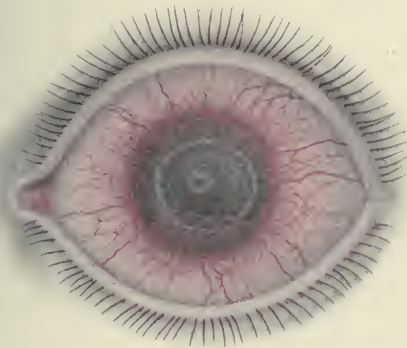










FIG. 1.

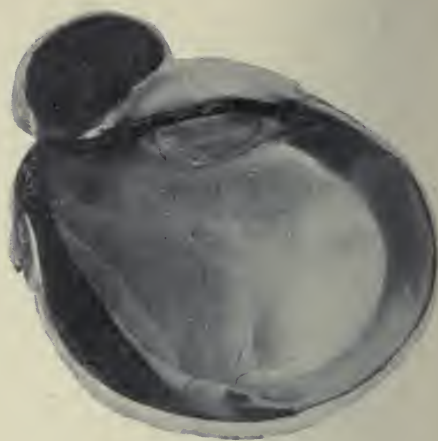


FIG. 2.

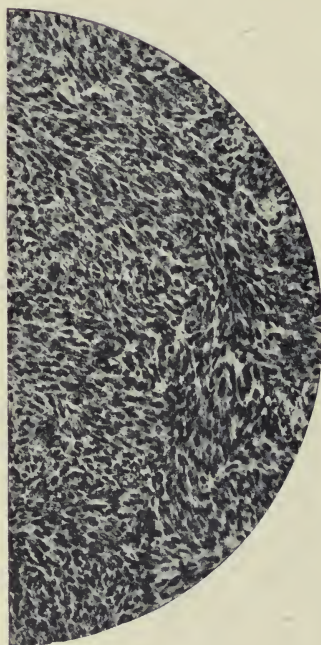


FIG. 3.

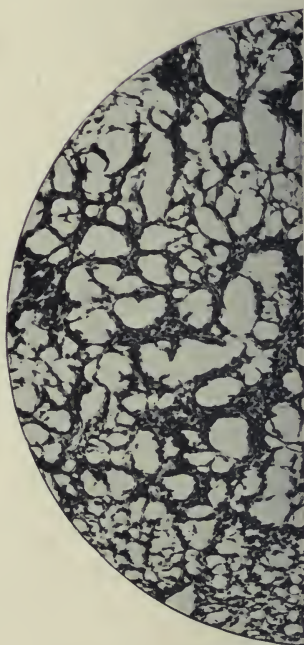


FIG. 4.

## DESCRIPTION OF THE ILLUSTRATIONS ON TEXT-PLATE II.

FIG. 1.—The upper nodule is a primary spindle-cell sarcoma. The large tumor of the limbus and the small nodule beside it are secondary growths, the latter invading the eye.

FIG. 2.—Photograph of sectioned eye (horizontal), showing secondary sarcoma of the limbus and involvement of the sclera, choroid, and ciliary body. (The infiltrated choroid is not easily to be distinguished from the sub-retinal coagulum.)

FIG. 3.—Photomicrograph (x 98) of the upper scleral nodule. (Primary spindle-cell sarcoma.)

FIG. 4.—Photomicrograph (x 98) of the secondary tumor of the limbus, showing cancellous structure. The intraocular portion of the growth showed an entirely similar structure.





## ARCHIVES OF OPHTHALMOLOGY.

A CASE OF PRIMARY EPIBULBAR SARCOMA, WITH  
SECONDARY GROWTHS IN LIMBUS AND SCLERA,  
AND INVASION OF THE CHOROID, CILIARY BODY,  
AND IRIS.

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THE following case is reported on account of certain anatomical features of unusual interest, and as an illustration of the malignancy of epibulbar sarcoma. It may also serve as a caution against the too ready acceptance of the view that epibulbar sarcomata are not of a highly malignant nature,—a view that of late seems to be gaining ground. The case entered the Massachusetts Charitable Eye and Ear Infirmary February 26, 1902, on the service of Dr. O. F. Wadsworth, to whose courtesy the writers are indebted for the opportunity of reporting the clinical history.

The clinical features of the case were as follows:

Peter Emond, forty years old, railroad employé. Family history negative, and general health good up to the time of admission. Two years ago he first noticed a small red spot the size of a pin-head above the cornea, which was visible only on raising the upper lid. One year ago he presented himself at the hospital, showing above the cornea a small round bluish elevation, supposed at that time to be a staphyloma of the sclera. One year later the patient again appeared at the hospital, this time

showing in addition to the original elevation a somewhat similar elevation situated at the nasal side of the cornea and also a large black tumor growing from the limbus. The latter was attached over a relatively small area of sclera and cornea, and formed a tongue-like projection, which protruded through the palpebral orifice and overlapped the lower lid. The condition presented at this time is very well shown in one of the illustrations. The pupil was slightly irregular and did not react to light. The lens was nearly completely cataractous, and the tension normal or slightly raised. At entrance the patient said that he had been troubled for about six months past with pain in the abdomen. An examination showed nodular masses in the hepatic region, and the diagnosis was made of probable metastatic sarcoma of various abdominal organs, presumably of retro-peritoneal glands and liver. Enucleation was advised and performed on March 3, 1902. The orbit healed without incident, but the abdominal pains increased. The patient was afterwards lost sight of and the final result has not been ascertained.

*Pathological condition.*—A small portion of the upper nodule was fixed in Zenker's fluid. The globe, with the other nodules attached, was hardened forty-eight hours in formalin, frozen, and sectioned in a horizontal plane, passing a little above the disc. Diameters of globe: antero-posterior 23.5 mm; horizontal, 24.5 mm; vertical, 22 mm.

*Macroscopic examination.*—Attached to the cornea and sclera there is a tumor mass made up of three nodules united at their bases. The largest measures 12 mm vert., 9 mm hor., 6 mm ant.-post., and is attached by a small base mainly to the cornea, upon which it has encroached for a distance of 5 mm. Its surface is brownish black and shows numerous large gray patches and many vessels. On section it is dirty brown and slightly mottled. It does not appear solid but presents a finely cancellous structure. Notwithstanding the fact that it has grown for the greatest distance upon the cornea, it has its firmest hold at the limbus and sclera. Behind the limbus for a distance of 1 mm the sclera still shows, but from this point for a distance of 5 mm it apparently has been entirely replaced by the new growth, which here presents itself externally as one of the three nodules already noted and forms a dark-blue globular elevation 6 mm in diameter, closely resembling in appearance a ciliary staphyloma. Continuing on from this nodule the tumor has invaded the

interior of the globe, growing as a thin black layer on the nasal wall, reaching from the root of the iris to the optic disc, and replacing the ciliary body and choroid. In its anterior portion it has for a distance of 1 cm a thickness of 1.5 mm, but it then rather abruptly becomes thinner and also lighter in color. Near the disc it becomes thicker again. It has extended downward almost to the inferior pole, and it reaches the superior pole above. It is noteworthy that the tumor of the limbus and the intraocular growth present the same cancellous appearance on section.

The remaining nodule is situated in the ciliary region above and is in continuity with both of the other nodules. It is 9 mm in greatest diameter and its surface is 4 mm above the sclera. It is not directly continuous with the intraocular growth and seems to involve only the superficial layers of the sclera. Its surface is blue in color and like the other scleral nodule it resembles a staphyloma. On section it appears solid, thereby differing markedly from the other portions of the growth.

The cornea (12 mm  $\times$  .66 mm) is perfectly clear except near the advancing margin of the tumor where there is a whitish opacity, somewhat elevated above the surface. At the equator on the temporal side the globe shows a slight staphylomatous bulging and the sclera is here as thin as tissue paper. The anterior chamber is 2 mm deep and free from coagulum. The pupillary margin is adherent to the lens on the nasal side, but the iris is otherwise apparently normal. The lens, 9 mm  $\times$  2.5 mm, is light yellow in color, somewhat opaque, and is cut with difficulty. The ciliary body on the temporal side seems normal, but on the nasal side it has been replaced by the new growth. The vitreous humor is faintly cloudy, slightly coagulated, and shrunk away from the retina posteriorly. Beginning at a point corresponding to the ora serrata, the retina is separated from the tumor as far back as the disc, the separation reaching the superior and inferior poles. Behind the separated retina there is a transparent, finely honeycombed coagulum. The retina is also separated in the form of a rounded elevation in the macular region. The optic nerve is translucent and homogeneous, and shows a cup .75 mm deep with overhanging edges.

*Microscopic examination.*—Celloidin sections were made of various portions of the tumor and globe and stained in hematoxylin and eosin, Van Gieson's stain, Mallory's phosphotungstic acid



hematoxylin, Weigert's elastic-tissue stain, and Ribbert's connective-tissue stain.

The upper nodule of the new growth shows the usual structure of a small spindle-cell melanotic sarcoma. The pigment is light yellow in color and consists of irregular granules which are practically always contained within the tumor cells. It is not abundant but has a fairly uniform distribution. The tumor cells are solidly packed together and the little stroma present in the nodule evidently belongs to the tumor itself. The nodule is covered by a capsule of connective tissue infiltrated with lymphoid, plasma, and tumor cells.

The tumor of the limbus and the intraocular growth are alike in their structure, but are entirely different from the nodule just described. Instead of being solidly packed together, the tumor cells line the walls of dilated spaces. The latter vary greatly in size in different portions of the growth, but in any one portion they are all about the same in size. The smallest spaces are found at the base of the tumor of the limbus and in the intraocular portion of the growth, and are usually perfectly round and closely resemble the fat spaces of adipose tissue. The largest spaces are seen in the centre of the tumor of the limbus, where they are very irregular in shape and communicate with one another through breaks in their walls. When the spaces are small it is easy to make out that they represent dilated spaces in the tissue, for the connective tissue in their walls is readily recognized. In case of the larger spaces, however, it is no longer possible to make out the connective-tissue stroma even in sections stained by Van Gieson's or Ribbert's methods. The walls of the smallest spaces are often lined by a single layer of tumor cells, but the walls of the largest spaces consist of a number of cell layers. In some instances a space is entirely filled up by the cells. Pigment is more abundant in the tumors of the choroid and the limbus than in the upper scleral nodule, but it has a less uniform distribution. There is no pigment present that gives the reaction for iron. The tumor of the limbus has no definite capsule of connective tissue but is covered by several layers of epithelium.

The inner nodule of the growth really represents a bulging of the sclera where the latter has been markedly infiltrated with tumor cells. Microscopically this is the most highly pigmented portion of the tumor, all of the cells being densely packed with pigment granules. The cells here do not line dilated spaces but

almost completely fill clefts between the fibres of the sclera. The infiltration of the sclera is directly continuous with that of the choroid and ciliary body.

The cells of the tumor of the limbus, and those of the intra-ocular portion of the growth, are in general spindle-shaped as in the upper nodule, but their nuclei are much richer in chromatin than are the cells of the latter. Here and there small groups of cells occur which are so densely pigmented that the character of the individual cells can be made out only in bleached specimens, and which are quite different from the other tumor cells. They are larger, almost spherical in shape, and their cytoplasm shows a distinct reticulum suggestive of that seen in the fat cells of xanthomata. Their nuclei are very small, poorly supplied with chromatin, and sometimes vesicular and perfectly round but more often so greatly distorted that they seem necrotic. All of the cells infiltrating the sclera are of this type, but no such cells are to be found in the upper nodule. Karyokinetic figures are not very numerous.

The growth as a whole is amply but not highly vascularized and shows no areas of necrosis and no hemorrhagic extravasations. The perivascular lymph spaces in their peripheral portions are widely dilated. There is no infiltration of the tumor itself with inflammatory cells.

Except near the tumor, the cornea shows nothing abnormal, and nowhere is it infiltrated with tumor cells. The tumor is not directly connected with the corneal stroma, but is separated from it by the corneal epithelium and by the epithelium covering the tumor. The two epithelial layers are fused together, but imperfectly, small spaces being visible between them. Beneath the tumor the corneal stroma is considerably infiltrated with pus cells. Bowman's membrane is for the most part intact, but in a few places beneath the tumor it has been replaced by connective tissue. Blood-vessels have grown in from the limbus beneath the membrane, but there are no vessels between it and the epithelium and none in the deeper layers of the cornea. On the nasal side the subconjunctival tissue of the limbus has been completely filled up with tumor cells; on the other side it shows an insignificant infiltration with lymphoid cells.

The iris is slightly cedematous and shows an increased number of fixed cells and some infiltration with lymphoid cells. The posterior epithelium is lifted up in the form of vesicles in many

places. On the nasal side the root of the iris blocks the filtration angle and is completely infiltrated with tumor cells. On this side the spaces of Fontana and the canal of Schlemm cannot be made out. The free anterior surface of the iris has been invaded by a direct extension of the growth, and shows several layers of pigmented tumor cells which reach the filtration angle on the other side and there infiltrate the spaces of Fontana. Here the filtration angle is only partially blocked by the root of the iris. The layers of tumor cells are not uniform in thickness over the surface of the iris, but here and there the cells are collected into small nodules.

The ciliary body on the nasal side has been completely infiltrated and disorganized by the tumor, and the ciliary processes have almost entirely disappeared. The surface of the ciliary body on this side is lined by an irregularly laminated hyaline membrane containing few cells, which posteriorly is continuous with the retina. On the temporal side the ciliary body and processes are atrophic, and the latter are more or less adherent to one another, forming the walls of cystic spaces. The choroid, except where it has been infiltrated by the tumor, shows nothing noteworthy.

The separated portion of the retina is œdematous, and shows perivascular collections of lymphoid and plasma cells and degeneration of the outer nuclear layer. At the ora serrata on the nasal side, the retina is infiltrated with pigmented tumor cells. The optic nerve is completely atrophied, overgrown with connective tissue, and highly œdematous. It shows no sarcomatous invasion.

*Pathological diagnosis.*—Primary episcleral melanotic spindle-cell sarcoma. Secondary growths in sclera and limbus, and invasion of the choroid, ciliary body, and iris.

From the clinical picture alone this case naturally enough was taken to be one of primary melanotic sarcoma of the limbus, the scleral nodules being regarded either as staphylomata or as secondary growths. An involvement of the interior of the eye was suspected on account of the complete loss of vision. Macroscopic examination of the enucleated eye bore out this clinical view of the case, but the microscopic examination, while confirming the extraocular origin of the growth, showed a different relationship between the epibulbar nodules. The solid structure of the upper nodule was in such marked contrast to the structure displayed by the rest of the growth, the latter showing an infiltrating



character throughout, that there could be no doubt that this upper nodule, not the tumor of the limbus, was the primary growth. This was in confirmation of the patient's statement, obtained later, that the upper nodule was the first to make its appearance. That the intraocular portion of the tumor did not represent the starting-point for the growth is clear from two facts: first, that it was not continuous with the upper nodule, the one first noticed by the patient, but with the tumor of the limbus; and second, that it had the same infiltrating character as the tumor of the limbus, consisting of œdematous tissue infiltrated with tumor cells. Macroscopically, too, it had the flattened-out appearance so characteristic of secondary growths within the eye. The sequence of events, therefore, was evidently as follows: There developed in the episcleral tissue just above the limbus, a solid spindle-cell sarcoma of the usual type, which after a time took on an exuberant growth towards the limbus. The tissue of the latter became more and more œdematous, and its dilated spaces became lined by, and in some places filled with, tumor cells. The infiltration then continued at the base of the tumor of the limbus thus formed, and extended into the sclera, finally penetrating the latter and invading the choroid, ciliary body, and iris. While in all probability metastases occurred in the internal organs, in the absence of a general autopsy this cannot be regarded as perfectly certain. It is interesting that the intraocular portion of the growth, except for its pigmentation, histologically presented an appearance almost identical with that of a metastatic carcinoma recently described by one of the writers.\* It is also interesting that the growth did not penetrate the globe directly at the limbus, but at a short distance behind it, thus substantiating the usual view that the limbus is peculiarly resistant to invasion by malignant growths.

Epibulbar sarcomata have been the subject of considerable discussion during the past thirty years, numerous cases being reported before 1873 by Althoff, Berthold,<sup>86</sup> Hirschberg,<sup>87</sup>

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\* Pathological report on Dr. Jack's case of metastatic carcinoma of the choroid. F. H. Verhoeff, *Trans. American Ophthalmological Soc.*, 1902.



and others; while more recently Adamück,<sup>1</sup> Silex,<sup>44</sup> Lagrange,<sup>21</sup> Sgrosso,<sup>46</sup> Strouse,<sup>60</sup> and Panas<sup>32</sup> have reported cases and added to the discussion. There is general agreement as to the main characteristics of these tumors, but there is considerable difference of opinion as to their malignancy and as to the advisability of radical or conservative treatment. Unfortunately the end results have been but seldom noted, so that accurate data as to recurrences and permanent cures are wanting. A most interesting feature of these tumors is their slight tendency to penetrate the globe, a fact that lends special interest to the present case, only four other such cases being reported. Strouse,<sup>60</sup> writing in 1897, and drawing his deductions from twenty-five cases, concluded that they never invaded the interior of the eye; while Panas,<sup>32</sup> recognizing that epibulbar tumors may penetrate inwards, cites only a case of epithelioma. Besides the present case, the writers, as above stated, have been able to find only four epibulbar sarcomata that involved the interior of a normal eye, though three others are known that penetrated an already shrunken globe.\*

Regarding the frequency of epibulbar sarcoma, Holmes,<sup>17</sup> in 1878, found 3 cases of sarcoma of the conjunctiva among 20,000 eye cases. Adamück<sup>1</sup> among 16,000 cases found 16 sarcomata involving the eye, of which 3 were epibulbar. Among 44,719 carefully recorded eye cases (1900-1901) at the Massachusetts Charitable Eye and Ear Infirmary,<sup>58</sup> there have been but 2 epibulbar sarcomata including the present case. It is interesting to add that in the same series of cases there were 10 sarcomata of the choroid and 6 epibulbar epitheliomata, all of the latter occurring at the limbus. Epibulbar sarcomata then appear to be, as Hirschberg first remarked, among the rarest of ocular tumors.

The literature contains reference to over 80 cases of purely epibulbar sarcoma situated at or near the limbus, not counting tumors at the fold of transition of the conjunctiva or on the palpebral conjunctiva. Of these the details of 73 were accessible to the writers. Of the 4 cases

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\* Kirschbaumer<sup>19</sup>: Cases 14, 15, and 16.

that penetrated the globe the first was reported by Kolaczek,<sup>20</sup> in 1880. The case was that of a man aged fifty-six with history of trauma which left a red spot on the conjunctiva that became the seat of tumor formation. This was abscised, but recurred finally as a tumor as large as a plum, involved the anterior segment of the eye and upper and lower lid, and was associated with enlarged preauricular gland. On enucleation four years after the original injury, the interior of the eye was found completely invaded by the neoplasm. In 1881, Adamück<sup>1</sup> reported the case of a man aged thirty-five, who had noticed for several months an apparent enlargement of the globe which on enucleation was found to be due to a diffuse flattened epibulbar tumor on the sclera extending from the cornea backwards to the optic nerve. At the equator, tumor elements were found to have penetrated between the layers of the sclera, and at other places there was complete penetration of the sclera and infiltration of the ciliary body,—the relatively limited extent of the intrabulbar portion leaving no doubt, according to Adamück, of its extrabulbar origin. There had been symptoms of glaucoma, thought to be due to pressure on the venæ vorticosæ. Von Michel<sup>27</sup> reports in 1899 the case of a man aged sixty-three, with a tumor about 6 mm in thickness extending on the sclera from the equator forward onto the upper third of the cornea. From the history it was supposed to have started in the episcleral tissue over the ciliary region. After enucleation the iris and choroid were found infiltrated with sarcoma cells throughout their whole extent. The perivascular canals of the ciliary body were also infiltrated, and von Michel concludes that it was by these canals that the neoplasm reached the interior of the globe. The fourth case, reported by Kirschbaumer,<sup>19</sup> was as follows: Tumor on cornea and sclera with a base 22 mm in diameter. Sarcoma cells under Bowman's membrane and in the upper layers of cornea and sclera. Ciliary body and root of iris involved, and tumor elements in the canal of Schlemm and in the lumen of the vessels. A possible fifth case, reported by Groenouw<sup>29</sup> was probably not of epibulbar origin, and microscopic sections showed the choroid infiltrated over a much

more extensive area than that occupied by the epibulbar growth. There was also atrophy of the iris, ciliary body, retina, and nerve; and for these reasons, together with the clinical history, Groenouw concludes that the case was of intraocular origin. Deutschmann<sup>60</sup> reported another case becoming epibulbar but probably starting in the ciliary body.

As to the mode by which epibulbar tumors are supposed to penetrate the eye, von Michel,<sup>27</sup> as above stated, thought that in his case it was by extension along the perivascular canals of the ciliary body. Groenouw<sup>60</sup> thinks there should be actual continuity by a connecting strand, and thinks extension by the lymphatics or ciliary arteries unlikely. In intraocular tumors, on the other hand, there may be epibulbar nodules even without visible perforation. In Adamück's case, as already noted, the tumor elements were seen to have perforated the sclera; and in the present case also it was plain that the interior of the eye was invaded by a direct extension.

It was early recognized that epibulbar sarcomata arise in the conjunctiva and in the great majority of cases at or very near the limbus, and Panas,<sup>22</sup> in his recent article, points out that the majority of all cases occur on exposed portions of the conjunctiva—*i. e.*, in the palpebral opening. They have been variously observed as black, brown, pink, or reddish tumors, sometimes forming smooth rounded elevations, and sometimes irregular nodular masses, often friable and bleeding freely; rather firmly attached at the limbus but movable with the conjunctiva on the sclera. The base of the tumor, even when the latter has reached large proportions, is almost always quite small, and Bloch reports one case with a pedicle  $1\frac{1}{2}$  cm long attached at the limbus. On the other hand, the tumor may exceptionally take the form of a diffuse flat swelling on the globe, and cover the entire cornea, and one case is reported that was connected with the cornea alone.\* As a rule, the tumor is readily separated from the cornea proper, and it is generally agreed that the corneal stroma is seldom invaded. It is true that

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\* Rumschewitsch.<sup>37</sup>



there is occasionally a slight loss of the superficial layers of the cornea, and Sgrosso<sup>46</sup> reports a case where the entire cornea with the exception of the membrane of Descemet was replaced by sarcoma tissue, but here the entire anterior segment of the eye, together with the orbital and palpebral conjunctiva, was involved, and the cornea may have atrophied, possibly from pressure. In the case reported by Wadsworth and Verhoeff,<sup>53</sup> the cornea was indeed infiltrated to one third of its depth by tumor cells, but in most cases the cornea shows a remarkable resistance, as does also the sclera in a nearly equal degree.

Without operative interference these tumors tend to increase steadily without pain, though with variable rapidity. The largest observed was that of a woman reported by Adamück.<sup>1</sup> His excellent illustration shows a tumor as large as a flattened orange protruding from the eye, which at operation was found to be connected with the globe alone, and entirely extraocular. The clinical history of the reported cases shows that the patients have noticed tumors beginning as small spots and reaching ordinarily in a year or thereabouts the size of a pea or bean. Sgrosso,<sup>46</sup> Green and Ewing,<sup>14</sup> and Lagrange<sup>22</sup> report cases where the patient had noticed a small spot for thirty, twenty-five, and fifteen years respectively, which finally underwent sudden growth and extension.

The majority of epibulbar sarcomata are found in people of advanced age, but Krautner,<sup>21</sup> Benson,<sup>5</sup> and Schultze<sup>42</sup> report cases respectively eight, eleven, and fourteen years of age. The average in the appended list of seventy-three cases is fifty-one years. Szulislawski<sup>51</sup> thought they occurred almost without exception in old people. As to pigmentation, twelve in the appended list of seventy-three cases were leucosarcomata; twenty-two contained small amounts of pigment; and thirty-nine were distinctly melanotic. Krautner<sup>21</sup> thought leucosarcomata especially rare. Actually it seems impossible to draw any sharp distinction as regards pigmentation, for recurrences from non-pigmented tumors have been melanotic; and melanotic tumors have recurred as leucosarcomata (Weinbaum).<sup>54</sup> In regard to



etiology, Strouse<sup>50</sup> cites traumatism, pre-existing pterygium, or irritation. Pfingst<sup>33</sup> observed particularly a traumatic case where after a blow on the eye there was a small red spot at the corneal margin which did not disappear but after a few months began to grow and in three years became a melanotic sarcoma. In the appended list of cases, six have history of trauma.

As to malignancy, Strouse<sup>50</sup> concludes that epibulbar sarcomata never penetrate the globe and that they practically never produce metastases. Schultze<sup>42</sup> is struck by their persistent tendency to recur and their slight inclination to invade the globe or produce metastases, and thinks epibulbar sarcomata not so malignant as epitheliomata in the corresponding location. Panas<sup>32</sup> draws no sharp line between sarcoma and epithelioma, and argues at length for and against the sarcomatous or epitheliomatous nature of certain epibulbar tumors. He believes that the malignant tumors are more often multiple and do not arise directly at the limbus but at some distance from it, being what he would call "peribulbar," and to illustrate his point cites the two cases of Seiderer.<sup>44</sup> He thinks that these are the purely sarcomatous cases, and that the strictly epibulbar tumors situated directly at the limbus have a mixed epitheliomatous and sarcomatous nature and are not malignant.\* Silex<sup>46</sup> notes that recurrences are common, that they tend to develop in the same locality, chiefly at the anterior part of the eye, and to grow slowly without penetration. Hence in his opinion their relative benignancy.

The writers do not believe in the reality of this relative benignancy, basing their opinion on the results of seventy-three published cases as set forth in the appended list. Of these cases, nineteen were treated by primary enucleation and fifty-three by primary abscission (in many cases later followed by enucleation), and one case was first seen at autopsy. The results were as follows:

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\* Only Panas and some other French observers have dwelt upon the supposed mixed nature of these tumors. In twelve epitheliomata and seven sarcomata examined histologically by one of the writers (Verhoeff), the distinction between the two classes of tumors was in every case perfectly clear.

Total primary abscissions ..... 53

No recurrence :

after six months' observation.....	1	
after one year's " "	4	
after two years' " "	1	
after several years' * " "	2	8

Recurrences occurred :

within one year.....	10	
within two years.....	3	
within several years †.....	4	
exact time not stated.....	19	36

Not followed after operation.....	9	
	<u>9</u>	53

Among the above thirty-six cases in which recurrences were observed, the following bad results were noted :

1.—Story and Graves<sup>49</sup>: recurrence with preauricular gland. Death in four years from general metastases.

2.—Weinbaum<sup>54</sup> (a): within three years enucleation, general metastases and death.

3.—Seiderer<sup>44</sup> (b): recurrence with preauricular gland in two and one-half years. Exenteration of orbit and death from supposed metastases.

4.—Kolaczek<sup>29</sup>: preauricular gland and invasion of interior of eye.

5.—Ole Bull and Gade<sup>30</sup>: recurrence in orbit and parotid region.

6.—Matthewson<sup>26</sup>: metastatic tumors on cheek and later on body generally.

7.—Mittendorf<sup>28</sup>: after several abscissions preauricular gland.

8.—Van Münster<sup>29</sup> (a): finally enucleation followed by recurrence in lids and orbit.

9.—Schultze<sup>42</sup> (b): recurrence in lids and orbit. Enucleation and exenteration.

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\* Joerss<sup>18</sup>: observed for 4 yrs. Weinbaum<sup>54</sup> (b): observed for 10 yrs. after second abscission.

† Estlander<sup>11</sup>: in 4 yrs. Lawford<sup>24</sup>: in 6 yrs. Panas<sup>22</sup> (a): in 10 yrs. Blanquinque<sup>6</sup>: in 6 yrs. after several abscissions.

10.—Szulislawski <sup>51</sup>: recurrence in lid from implantation.

11.—Von Michel <sup>37</sup>(a): enucleation and recurrence.

12.—Silex <sup>45</sup>(a): recurrence in lids and doubtful tumor in abdomen.

Of the remaining abscission cases that recurred, seven are mentioned as having recurrences but the final result is not stated, four remained several years before recurring (see footnote on p. 109), nine were enucleated without further observation, and four were enucleated and remained for a certain time at least without recurrence: and it should of course be noted that among the above recurrence cases and enucleation cases that were not further followed as well as among the primary abscission cases in which there is no note of any recurrence at all, there must have been a certain proportion of serious results. It appears, therefore, that among all the abscission cases the only reported positively good results were in the six cases mentioned in the footnotes on p. 109 and in the above four enucleation cases.\*

As regards the malignancy of the cases treated by primary enucleation (nineteen in number), the following facts are noted:

Adamück <sup>1</sup>(b): interior of the eye involved.

v. Michel <sup>37</sup>(b): interior of the eye involved.

Adamück <sup>1</sup>(c): preauricular gland at time of operation.

Sgrosso <sup>46</sup>(a): lids involved at time of operation.

Seiderer <sup>44</sup>(a): in two years after enucleation recurrence in lids and orbit. Exenteration and no recurrence after four years.

Wadsworth and Verhoeff <sup>53</sup>: secondary tumor on lid from implantation.

Kirschbaumer <sup>19</sup>(a): enucleation and death in two and a half years from general metastases.

Wiegand <sup>50</sup>: recurrence in lid and submaxillary region.

Of the remaining eleven primary enucleation cases, one

\* Lagrange <sup>32</sup>(a): after abscission and enucleation no recurrence after ten years.

Kirschbaumer <sup>19</sup>(b): after repeated abscissions exenteration of orbit and no recurrence after five years.

Van Münster <sup>29</sup>(b): after abscission and enucleation no recurrence after one and one half years.

Barrenechia <sup>3</sup>: after abscission and enucleation no recurrence after one year.



(Lagrange, *b*) had no recurrence after ten years, and in the remainder the after history is not given; from which it cannot be inferred, however, that there were no recurrences, as such cases might often reach the hands of the general practitioner rather than the oculist.

The one case (Addario<sup>7</sup>) first seen at autopsy showed metastases throughout the internal organs.

In view of the above, the writers feel that epibulbar sarcomata must be considered highly malignant, judging by their tendency to recur and produce general metastases. That the immediate results are not always serious and suggest a relative benignancy, may be explained by the facts that these tumors are at first isolated on the conjunctiva resting on sclera and cornea, both highly resistant to invasion; and that they are observed very early, for an epibulbar tumor is noticed and treated much sooner than a small nodule elsewhere. Histologically they do not differ from other sarcomata, and the writers believe them to be essentially no less malignant. That a few may be cured by abscission alone, can be explained by their small size and isolated situation at the time of operation. These cases, however, are few, and it will be observed that in the forty-four cases of abscission that were followed (where operation was performed in most cases before the tumor had exceeded the size of a pea) recurrences were known to have occurred in thirty-six—*i. e.*, in 81.8 % (and in all probability in many of the others which were not observed), and in the total number of cases, omitting only the nine abscission and the ten enucleation cases not followed after operation (fifty-four), metastases occurred either before or after operation in twelve (22 %), six of which were general (11 %). That the results after enucleation would be more favorable is natural on account of the more radical nature of the operation; and that there were some general metastases even after enucleation certainly strengthens the argument in favor of the malignant nature of epibulbar sarcomata.\*

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\* As an unusual manifestation of malignancy, the case of Szulislawski<sup>51</sup> and that of Wadsworth and Verhoeff<sup>53</sup> may be mentioned in which there was a secondary growth on the lid, produced by implantation.



The trend of opinion among most observers is in favor of simple removal at first with more and more radical treatment as recurrences occur. Silex <sup>46</sup> thinks the choice of operation should depend upon the intelligence of the patient and his ability to report for observation ; and he favors enucleation where there is any chance that the patient may neglect medical treatment or in any case if vision is lost (and it may be noted that it is almost always impaired from irregular astigmatism). While recognizing the malignancy of these tumors on general surgical and pathological principles, Silex deplors the too ready enucleation of eyes regardless of sight and the extent of the neoplasm. Lagrange <sup>22</sup> is of the same opinion, remarking that although these tumors are of the same structure as the most malignant melanotic tumors, they are remarkable for their benign behavior, and he thinks a radical operation should only be done when they threaten to spread over the entire globe.

In opposition to the above, the writers believe that simple abscissions are decidedly dangerous, and that in view of the safety of the patient enucleation is always to be preferred. A large number of all abscission cases finally come to enucleation after a more or less protracted period of ineffectual treatment, and thus at a most unfavorable time.

#### CONCLUSIONS.

(1) Epibulbar sarcoma differs from general sarcoma in malignancy only in so far as it is isolated on the highly resistant cornea and sclera, and comes to operation relatively small.

(2) While highly malignant it seldom penetrates the interior of the eye.

(3) After abscission recurrence, sooner or later, almost invariably occurs and general metastases are not infrequent.

(4) A microscopic examination having made the diagnosis certain, immediate enucleation should be advised in all cases, but the final choice of operation must lie with the patient, to whom the highly unfavorable prognosis has been made clear.

(1) ADAMÜCK. (a) Man, forty. For many years small blackish spot on conjunctiva. Rapid increase within a few months to size of a walnut, extending from cornea to equator. Excision. No recurrence after one year. Spindle cells with some pigment.

(b) Man, thirty-five. Flattened tumor on sclera from cornea to optic nerve noticed by patient for only a few months. Enucleation. Interior of eye involved. Some pigment. No note as to recurrence.

(c) Woman, fifty-five. Tumor as large as an orange resting on globe and extending from cornea to optic nerve. Several years' duration. Preauricular gland. Enucleation. Melanotic sarcoma. No note as to recurrence.

(2) ADDARIO. Man, eighty-five. Tumor at anterior segment of eye 37 by 25 mm. Duration two and a half years. Case first seen at autopsy. Throughout internal organs "small black spots and nodules" were found. Tumor consisted of spindle cells. Melanotic.

(3) BARRENECHIA. Man, fifty-two. For two years small tumor at limbus the size of a pea. Abscission. Recurrence in one year, and second abscission. Again recurred as tumor extending from cornea to optic nerve. Enucleation and no recurrence after one year. Large-cell sarcoma.

(4) BAUMGARTEN. At first small black spot near the limbus. In three years the entire half of the bulbar conjunctiva covered with black nodules. Enucleation. Large, round, and spindle cells.

(5) BENSON. Child, eleven. Small tumor at limbus the size of a pea for five years. Abscission. "Sarcomatous-looking cells" with pigment. No recurrence after one year.

(6) BLANQUINQUE. Woman, sixty. Small spot near cornea for twenty years. Size of a pea when operated. Abscission several times. Again recurrence after interval of six years. Melanosarcoma.

(7) BLOCH. Woman, fifty-one. Pediculated tumor at limbus. Rapid growth within three months. Abscission. Large-cell leucosarcoma. No recurrence mentioned.

(8) BOCK. Man, sixty-two. Tumor as large as a pea at limbus, of one year's duration. No operation till one year later, when tumor had increased and filled space between the lids. Enucleation. Large-cell Sarcoma. Melanotic. No recurrence mentioned.

(9) DEGERING. Woman, seventy-seven. Flattened fungoid

tumor at limbus large enough to prevent closure of lids. Duration four years. Enucleation. Result not noted. Large round cells. Melanotic.

(10) DONALDSON. Woman, twenty-one. Tumor at limbus as large as a bean, of nine months' duration. Abscission. No recurrence after one month. Leucosarcoma. Round cells.

(11) ESTLANDER. Woman, thirty-three. Tumor at limbus following injury. In seven years the size of a pea. Pigmentation of conjunctiva about the cornea. Abscission and in four years multiple recurrences. Small round cells.

(12) FANO. Old man. Pigment spots on conjunctiva bulbi et tarsi. After five years two tumors as large as beans in upper-inner quadrant of conjunctiva bulbi. Abscission and recurrence in one year. Large cells with pigment.

(13) GIULINI. Man, fifty-two. For many years a small spot on bulbar conjunctiva, which within one year began to grow, covering front of the globe. Abscission. Melanosarcoma. No note as to recurrence.

(14) GREEN and EWING. Man fifty-seven. Began twenty-five years ago as spot at the limbus. When operated was as large as a bean and on both cornea and sclera. Enucleation. Spindle cells. No pigment. No note as to recurrence.

(15) GROSSMANN. Woman, thirty. Small tumor on conjunctiva, near insertion of sup. rectus. Abscission. Spindle cells without pigment. No note as to recurrence.

(16) HEDDÄUS. Man, fifty-four. Tumor at limbus as large as a cherry. Color brownish black. Duration three years. Abscission. No recurrence after two years.

(17) HOLMES. Woman, forty. A small spot on the limbus for many years, which within two years had increased in size. Twice removed and recurred. Finally enucleation. Round-cell sarcoma. Melanotic. Later history not stated.

(18) JOERSS. Man, sixty-two. Tumor 2 by 1 *cm* from edge of cornea to outer canthus. One year's duration. Abscission. Small-cell leucosarcoma. No recurrence after four years.

(19) KIRSCHBAUMER. (a) Woman, fifty-eight. Tumor starting from small spot near limbus, and extending from cornea to equator. Enucleation and death in two and one half years from general metastases. Melanotic.

(b) Woman, thirty-eight. Tumor near limbus as large as a pea, starting from small brown spot. After repeated abscissions tumor



returned, extending from the limbus backward into the orbit. Exenteration, and no recurrence after five years.

(20) KOLACZEK. Man, fifty-six. Redness at inner part of conjunctiva after injury, followed by tumor formation at same spot. Abscission and recurrence. Tumor finally as large as a plum involving both lids and anterior segment of eye. Preauricular gland. Enucleation. Invasion of interior of eye. Melanotic angiosarcoma.

(21) KRAUTNER. Child, eight. Small tumor above the cornea near limbus. Abscission. Small spindle-cells, without pigment. No recurrence mentioned.

(22) LAGRANGE. (a) Woman, seventy-five. Small tumor at limbus for fifteen years. Sudden growth within three years. Abscission. Several recurrences and tumor finally as large as a cherry. Enucleation and no recurrence after ten years. Spindle-cell melanosa. melanosa.

(b) Woman, forty-two. Tumor at limbus as large as a small egg. Of two years' duration. Enucleation and no recurrence after ten years.

(23) DE LAPERSONNE et CURTIS. Man, sixty. Tumor of a few months' duration, about 12 mm long, at limbus. Abscission. No recurrence after several months. Alveolar sarcoma. Some pigment.

(24) LAWFORD. Man, twenty-eight. Four years previously a small red spot at limbus treated with cautery. Six years later recurrence as large as a pea. Abscission followed by rapid recurrence. Later history not stated. Spindle-cell sarcoma. No pigment.

(25) MATTHEWSON. Man, twenty-two. Tumor at limbus for three years, preceded one year before by an injury. Tumor size of a bean. Associated with metastasis on cheek and later on surface of body generally. Abscission. Melanotic. Small cell. Final result not stated.

(26) MEIGHAN. Man, sixty-three. Small tumor at the limbus following injury. Abscission in three years. After two recurrences finally became very large. Enucleation.

(27) v. MICHEL. (a) Woman, fifty-four. Tumor overhanging limbus. Abscission, and in two years recurrence and enucleation. Followed in two years again by recurrence in conjunctiva. Large-cell leucosa. Final result not stated.

(b) Man, sixty-three. Flattened tumor extending from the



cornea backwards to the equator, 6 mm in thickness. Enucleation. Interior of the eye invaded. Small-cell leucosarcoma. Final result not stated.

(28) MITTENDORF. Woman, forty-six. For less than a year a blackish tumor near limbus. Abscission. In six months multiple recurrences and removal, and in two years again recurrences, preauricular glands, and abscission. Recurrence after the last operation in four weeks. Mittendorf did not expect to save life of patient.

(29) VAN MÜNSTER. (a) Woman, thirty. For twelve years a blackish spot a few mm from the limbus, which gradually increased and was abscised. Recurrence in one year and second abscission. Again recurrence in one year, but not operated for eight years (enucleation), after which there were three recurrences in lid and orbit within two and a half years. After last removal no recurrence after three months. Round- and spindle-cell sarcoma. Some pigment.

(b) Man, fifty-five. Epibulbar tumor removed twelve years before, after which there was gradual growth of pigment throughout conjunctiva, and recurrence of tumor. After third recurrence enucleation. No recurrence after year and a half. Spindle cells.

(30) OLE BULL and GADE. (a) Man, seventy-one. Black tumor close to the limbus, size of a bean, of four years' duration. Enucleation. Round cells with pigment. Final result not stated.

(b) Man, seventy-three. Small melanotic tumor near the limbus, removed by abscission. Five recurrences, eventually in orbit and parotid region. Enucleation and exenteration of orbit. Spindle cell. Death. Cause not stated.

(31) PAGENSTECHE and GENTH. Man, twenty. Five months after a blow on eye a painful tumor at limbus, which was abscised and recurred in one month, and soon covered the whole anterior portion of the eye. Enucleation. Round-cell sarcoma. Cornea destroyed, except membrane of Descemet.

(32) PANAS. (a) Woman, sixty-one. Abscission of tumor near limbus when thirty-three years old. Recurrence in ten years. Again abscission with rapid recurrence. Finally extended from the cornea to semilunar fold. Tumor removed without enucleation. Final result not stated. Melanotic sarcoma.

(b) Man, forty-six. Small tumor at limbus for three years. Two abscissions. No recurrence after one year. Melanotic.

(c) Man, seventy-one. Tumor at limbus. Abscission. No recurrence after several months. Melanotic.

(33) PFINGST. Injury three years before, which left a red spot on conjunctiva, which developed into a tumor, encroaching on cornea. Twice abscised and recurred. No recurrence after last operation after two years.

(34) REMAK. Woman. Pedunculated tumor at limbus, of three years' duration. When operated was as large as a small apple. Three abscissions and finally enucleation. Final result not stated. Melanotic.

(35) REID. Man, forty-five. Small black spot at the limbus. Abscission, and after five recurrences enucleation. Alveolar melanosarcoma.

(36) ROBERTS. Tumor at limbus. Abscission and recurrence in two years. Melanotic.

(37) RUMSCHEWITSCH. Man, sixty-one. Tumor from cornea. Enucleation. Final result not stated. Spindle and round cells.

(38) SCHIESS-GEMUSEUS. Man, seventy. Tumor at limbus as large as a bean. Abscission. Partly pigmented. No recurrence after one year.

(39) SCHMALZ. Woman, sixty-nine. Tumor at limbus. Also preauricular gland. Abscission. Round-cell sarcoma. No note as to recurrence.

(40) SCHMID. Woman, twenty. Tumor covering entire surface of cornea. Enucleation. Small-cell sarcoma. No note as to recurrence.

(41) SCHOEN. Woman, twenty-five. For three years small black speck near the cornea. Presented tumor as large as a bean. Abscission. Melanotic sarcoma. Also small tumor near caruncle. Abscission. Melanotic sarcoma. Recurrence in eight months. No return after "long interval."

(42) SCHULTZE. (a) Child, fourteen. Small tumor at limbus in each eye. Abscission. Round cell. Melanotic. No recurrence after six months.

(b) Woman, sixty-one. Tumor involving one third of limbus, of three years' duration. Melanotic spindle-cell sarcoma. Recurrence in one year and second abscission. Followed in two years by recurrence in lid and orbit. Enucleation and exenteration of orbit. Final result not stated.

(43) SCROCZINSKY. (a) Man, sixty. On conjunctiva and

limbus. Reddish, size of a bean. Abscission and no recurrence after one year.

(44) SEIDERER. (a) Woman, fifty-eight. Multiple melanotic tumors at and near limbus. Enucleation and recurrence in two and a half years in lids and orbit. Exenteration. No recurrence after four years. Round and spindle cells. Melanotic.

(b) Small tumor near limbus, of six years' duration. Abscission and in two and a half years recurrence, covering entire cornea. Preauricular gland. Exenteration of orbit. Death in two and a half years from supposed general metastases.

(45) SILEX. (a) Woman, sixty-three. For ten years small black spot at limbus. Rapid growth within two months to size of a hazel-nut. Abscission. Repeated recurrences in plica and lids. And doubtful tumor in abdomen (for three years). Melanotic round-cell sarcoma.

(b) Woman, sixty-four. Tumor at limbus 5 mm in diameter, of nine weeks' duration. In one year recurrence, and second abscission. Followed by second recurrence at limbus, also in lids. Melanotic round-cell sarcoma. After history not known.

(c) Man, twenty-nine. Tumor at limbus 6 x 8 mm. Enucleation after three abscissions. Melanosarcoma. Final result not noted.

(d) Man, forty-nine. For two years black spot at limbus. Tumor finally covered entire cornea. Abscised three times. After fourth recurrence (seven years), enucleation. No recurrence after eight months. Melanotic round-cell sarcoma.

(46) SGROSSO. (a) Man, fifty. Small spot in conjunctiva for thirty years. Rapid growth within three years, finally involving anterior segment of eye and orbital and palpebral conjunctiva. Exenteration of orbit. Melanotic. Final result not stated.

(b) Man, forty. Small tumor at limbus as large as a pea for five years. Then second tumor also at limbus. Abscission first. Finally enucleation. Small-cell leucosarcoma. Final result not stated.

(47) SOCIN. Man, sixty-one. Non-pigmented tumor near the limbus. Abscission and recurrence in six weeks. Enucleation and no recurrence after eight months. Round- and spindle-cell sarcoma.

(48) ST. JOHN. Man, seventy-two. Tumor at limbus as large as a pea, of two months' duration. Abscission. Spindle-cell leucosarcoma. No note as to recurrence.

(49) STORY and GRAVES. (a) Man, fifty-four. Tumor at



the limbus. Abscission. Recurrence with preauricular gland. Second operation. Death in four years from general metastases. Melanotic alveolar sarcoma.

(*b*) Man, seventy-six. Pigmented tumor at limbus. Enucleation (?). Spindle-cell sarcoma with pigment. Final result not stated.

(*c*) Man, fifty-seven. Tumor starting at the limbus, finally covering the entire cornea. Enucleation. Melanotic spindle-cell sarcoma. Final result not stated.

(50) STROUSE. Woman, seventy-two. Tumor at limbus as large as a hazel-nut, of gradual growth. Abscission. Recurrence yearly for three years. Final result not stated. Large-cell sarcoma with some pigment.

(51) SZULISLAWSKI. Man, fifty-five. Tumor at the limbus of one year's duration. Abscission and recurrence in one year affecting the upper lid from supposed implantation. Small-cell melanosarcoma. Final result not stated.

(52) VOSSIUS. Man, sixty-seven. Small spot near limbus for three years. Rapid growth within half a year. Enucleation. Spindle-cell sarcoma with some pigment. No note as to recurrence.

(53) WADSWORTH and VERHOEFF. Man, eighty-two. Tumor at limbus 12 by 11 mm, beginning one year before as small spot. Enucleation. There was also a small sarcomatous growth on lower lid from supposed implantation. Melanotic giant-cell sarcoma. After result not noted.

(54) WEINBAUM. (*a*) Woman, forty. Tumor at limbus as large as a pea, beginning one year before as small brown spot. Also numerous brown spots throughout bulbar conjunctiva. Abscission and multiple recurrences. After two years recurrence as large as walnut. Enucleation, followed in one year by recurrences in orbit and general metastases and death (autopsy). First tumors melanotic ; later, leucosarcoma.

(*b*) Man, twenty-six. Tumor as large as a pea near limbus, of one and one half year's duration. Abscission and no recurrence till after six years. Second abscission. After which no recurrence as long as patient lived (ten years). At first leucosarcoma. Recurrence melanotic.

(55) WIEGAND. Man, seventy-seven. Tumor near limbus as large as a pea, of a few months' duration. Enucleation and recurrence in lid and submaxillary region after six months. Round-cell melanotic sarcoma.



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## THE ACCURACY REQUISITE IN VISION-TESTING.<sup>1</sup>

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FOR the purpose of estimating the aberration of refraction in vision-testing, our objective methods of examination, as yielding more exact and reliable data, must take precedence over the subjective procedure. The latter, however, cannot be overlooked, as it is of inestimable value both independently and for corroboration, and, as such, forms the initial step of any investigation. On those occasions, which are numerous, when it does not fully remedy or explain the defect in vision, the case ought in every instance to be submitted to the objective method. More than one system for this is at our disposal: there are the ophthalmoscopic methods, both the direct and the indirect (or Schmidt-Rimpler method), the use of the ophthalmometer (Javal-Schiötz or other make), as well as retinoscopy (or the method ascribed to Cuignet). Principal reference will be made here to the last-mentioned as being the one most frequently used, which may, besides other reasons, be owing partly to its advantages when employed even under unfavorable circumstances, such as difficulty caused by restlessness of the patient, or, on the other hand, fatigue on the part of the surgeon.

There are certain points in the use of this form of retinoscopy which, though not always observed, are of essential service in achieving a uniform standard of accuracy in the

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<sup>1</sup> Read before the International Medical Congress in Cairo, Dec. 1902.



results elicited. The first and most important of these is the care which should be given to bringing the optical centres of the trial-lenses into exact coincidence, so far as is possible, with the axial line of vision of each eye. The trial-frames used for holding the lenses in position should be preferably those whose parts are movable by rack and pinion, and are supplied with a scale indicating the measurement of position, both in the horizontal and vertical directions. It is a matter of regret that the trial-frames are frequently adjusted to the patient in a haphazard way, which tends to produce inaccurate results, as the lenses, being decentred, act incorrectly as prisms instead of in their normal spherical purpose. It is also essential, in any subsequent examination of the eyes, either for further investigation or comparison, and which may be either subjective or objective, that the lenses should be made to assume an exactly similar position in relation to the eyes as on the original occasion. The surgeon is also thereby enabled, when ordering spectacles, to furnish the optician with exact particulars for the frames; and it permits due attention being given to, and allowance made for, the changes in measurement associated with the natural growth and expansion of the face in young subjects. The record further serves as a basis for defining the different degrees of separation between the lenses before the two eyes, according to the purpose for which the glasses may be required, such as for far or nearer distance, or for close work. A ready and simple means, adapted to facilitate and ensure accuracy when thus measuring the exact position of the pupillary centres, is found in the use of a cross-bar pupillometer with the trial-frames, as described in the *Lancet* (1900, vol. i., p. 627), slightly modified, or some similar device to serve the same purpose.

Although a cycloplegic is not always employed for making this objective examination of a patient, one should always be used, in order to get a fully correct result, unless it is otherwise strongly and distinctly contra-indicated. Here again the circumstances of the case are not always sufficiently regarded, and not infrequently atropine in solution is heedlessly and almost indiscriminately used, when a milder


and more quickly transient effect would amply suffice; the consequence is that the professional or other skilled worker, or the ordinary artisan, is unnecessarily inconvenienced for a considerable period from efficiently following his daily occupation, which in many instances, and especially amongst hospital patients, may be his sole means of gaining livelihood.

An additional point is the correct estimation of the position of inclination of the cylindrical aberration, when astigmatism is present. Entire reliance for this is usually placed on the subjective examination, whereas it can be readily found objectively, and the surgeon should always hold it as his office to do so. When the total error has been fully corrected, the cylindrical lens only needs to be rotated in the trial-frame until a completely emmetropic effect of shadow-movement becomes apparent in response to the excursions of the retinoscopy mirror. This observation, if carefully made, will usually be found correct when verified afterwards by means of the astigmatic ray-chart. Before the patient is moved away from the lamp, the methodical examination of the interior of the eye should never be omitted, as errors of judgment are then much less apt to occur.

Whilst the pupil is still dilated and the accommodation relaxed, it is always advisable to take the opportunity of making a subjective examination in corroboration, so that, if any discrepancies are found, immediate reference again to the objective method is quite easy. Such an examination is feasible and so far satisfactorily accomplished by using with the trial-lenses an operculum before each eye, having a central circular aperture corresponding to the size of the pupil when moderately dilated. The results thus attained serve as an approximately close guide for the final subjective test of vision, when the eye has recovered from the effects of the cycloplegic and returned to its normal state.

Often a very little care bestowed on a point of detail will discover and overcome the cause of defects which may have been previously regarded as being irremediable, inherent, or functional.

When the nature and degree of the refractive error have been discovered by the objective method of examination, and the fundus explored for any abnormalities, the subjective test for vision can be completed. For this purpose the optotype designed by Dr. Edmund Landolt, of Paris, and described in the *Annals of Ophthalmology*, U. S. A. (vol. x., p. 207), are those best adapted for universal acceptance. That there is distinct need of general and, if possible, world-wide uniformity on this point, is an axiom which cannot be seriously disputed, as it is only by such exact means that accurate and reliable comparison can be made with regard to the condition and results obtained in the treatment of cases, whether occurring amongst people of varied stations in life, or with differing degrees of scholastic training, and wholly irrespective of their individual age, race, or nationality. These optotype are equally available for the fully educated as for the illiterate, for young children as for adults, and for those the characters of whose language are written from left to right, as for those where they run in the reverse direction. When the suitability of the optotype for their purpose has been fully recognized, an easy and most useful standard will thus be established, which should effect still greater cohesion amongst ophthalmic workers and add interest to the results which they obtain.

The only point in which these optotype will bear simplification without detracting from their value, and thus perhaps bring them more readily into favor, is by confining their use to the four positions in which the hiatus of the circle is directed exactly upwards, downwards, and to either side, thus , and omitting those other four forms where the opening is placed at a position of 45° angle. In practice it is found that the latter do not admit of such clear and ready interpretation, even by patients of ordinary intelligence and education. When the position of the test-board is simply altered, it at once changes the reading of the optotype characters, the gap in each circle pointing in a fresh direction without the character undergoing any other change in form; thus sufficient variety is always available, obviating any possibility of their being committed to memory by



rote, and consequently interfering with their usefulness as a test.

Still further accuracy would be obtained, and absolute similarity be ensured, if the illumination of the test-board could, for the purposes of standard comparison, always be of the same uniform intensity. This can only be secured by the use of artificial lighting, in preference to daylight, and it should be of specified candle-power strength and without the use of a reflector to increase it. Even in countries where there is uninterrupted sunshine, the natural intensity of the light is never constant throughout the day, as it varies in accordance with the hour and also with the different seasons of the year. It is further affected by the aspect of the room which is used for the examination, the size and number of the windows, as well as their relative position to, and distance from, the test-type board. All these considerations are at once eliminated by the use of artificial light of given power, which is screened from the observer and placed in a definite position with relation to the optotype.

The due appreciation of color-sense is a further important element, which, for practical purposes, must often enter into the visual examination. This is most requisite in the cases of those employed on railways, or in navigation, or any other occupation where there is either temporarily or continuously, insufficient daylight; and the directions for general safety, mutual benefit, or other purpose, are given by means of colored lights. Those commonly in use are four in number,—a clear bright light, also red, green, and violet-colored lights. Therefore, if an individual can satisfy us that these can be quickly and readily recognized in a practical manner, we may consider the case fitted, in this particular, for the foregoing occupations, and without any real need for us to enter into further detail, although there is nothing to prevent this being done whenever necessary. The ideal method of course is to reproduce the exact conditions under which the individual works, artificial light being used and the various colored glasses interposed in front of it, a piece of frosted glass being also introduced for the purposes of confusion. A disc in which these glasses are mounted revolves, in front



of an aperture, on the ordinary shield which screens the ophthalmoscopic lamp; the degree of illumination can be modified by using an iris-diaphragm to vary the size of the aperture, or an additional disc for the purpose, placed on the same axis, may have a series of holes pierced of graduating size, ranging from 1 to 6 *mm* or larger. When such means are not available, an equally practical method for testing this power of color discrimination, is to employ a series of rounded pieces of paper of the corresponding colors, placed on a dark background; their sequence and relative position to each other can be easily changed by altering the position of the board, as in the use of the Landolt optotype. It does not detract from the practical value of this test, to indicate in the first instance to the individual who is being examined, the respective names of the colors, as their relative position to each other is afterwards very readily changed, and it is their instant recognition, and not their matching or comparison, which is requisite.

The various apparatus which have been mentioned are made by the Anglo-American Optical Company of London and New York. The optotype test-board and color-chart are conveniently combined on a three-sided drum which can be turned on its long axis; this is preferable to a drum with four or more sides, as only one surface can be seen at a time, and there is consequently no uncertainty. Two of the sides of the drum show differing settings of the optotype, and as it can be suspended with either end or side upwards, several entirely different dispositions are thus produced: the optotype are placed linearly in a series of graduated sizes, and a model of the largest of them is supplied with the drum, so that the test can be made intelligible to any one; the color-chart, occupying the third side, similarly presents four different arrangements, which is found sufficient to produce confusion when desired.

The whole question is one deserving of more attention than it often receives; it is of the first importance and not a negligible duty, because it is the principal evidence which can be adduced in support of the results of any particular treatment or other measures,—surgical, remedial, or prophyl-

lactic; and it should always be so carried out that statements can be made, entirely devoid of ambiguity, in order that absolute reliance can be placed on them, thus permitting of their free use for the purposes of comparison. This applies equally to every country and to people of all conditions of civilization.

## THE OPHTHALMOSCOPIC APPEARANCE OF THE ORA SERRATA AND THE CILIARY PROCESSES.<sup>1</sup>

BY DR. M. REIMAR, BRUNSWICK.

(With Plate IX. of Vol. XLI., German Edition, 1900.)

Translated by Dr. WARD A. HOLDEN.

IN his paper on the anterior limits of the visible fundus, Groenouw (*Arch. f. Ophth.*, xxxv., 3, p. 29) comes to the conclusion that the extent of retina visible does not depend upon the cornea and its curvature, nor upon the size of the pupil except when this is very narrow, but almost entirely upon the location of the anterior surface of the lens in relation to the corneal margin,—that the ophthalmoscopic field extends farther forward the nearer the lens lies to the cornea or the shallower the anterior chamber. Both by computation and empirically, he finds the distance from the margin of the cornea to the limits of the visible fundus 7.6–9.8 *mm* or on an average 8.5 *mm*. Groenouw did not go into details regarding the conditions in aphakia after extraction, because the secondary cataract interferes with the accuracy of the measurements.

From Groenouw's paper one obtains the idea that in aphakia the extent of fundus visible depends only upon the width of the pupil, and the influence of the pupil in this case is the greater because the iris is not pushed forward by the lens but forms a flat diaphragm.

But even when the pupil is dilated ad maximum the iris will restrict the ophthalmoscopic field. When, however, the

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<sup>1</sup> From the University Eye Clinic at Zurich.

iris is wanting up to its periphery, either at one spot or in its entire circumference, the extent of the field will depend solely upon the optical relations of the cornea.

In examining the fundus of a patient on whom extraction with iridectomy had been done, I found the ora serrata, and then it occurring to me that one should be able in such an eye to see the ciliary processes I found that this was feasible. In general there are technical difficulties in the way. The coloboma must extend to the periphery and the secondary cataract must be thin or cut through in order that a view of the ciliary processes may be obtained. Further, one must look into the eye very peripherally. If the coloboma is upward, the patient must sit on a high stool, throw the head back, and turn the eye upward, while the upper or lower lid is retracted; the observer must sit on a low stool much below the patient — positions which are uncomfortable for both. It is probable that the examination could be better made with an electric ophthalmoscope while the patient was in a reclining posture.

In time I found several cases in which the examination was possible owing to favorable circumstances, and I obtained sharp and extensive images of the most anterior positions of the interior of the eye. Although these observations at present have no directly practical value, I believe that they are of sufficient theoretical interest to warrant their description.

The periphery of the fundus is characterized first by a diminution of pigmentation, causing the parts to appear of a paler red, while the choroidal vessels become fewer in number and more meridional in course.

Farther in the periphery appears a stripe of pigment concentric with the equator, which begins with small clumps of pigment which become more numerous to form a regular closely granular band. From this band processes of pigment extend forward, forming remarkably regular arcades.

The intensity of pigmentation of this circular band and its processes varies considerably in different persons, and the band appears narrower or broader, and the processes shorter or longer. The color ranges from dark brownish-green to light grayish-brown. Frequently there appears, particularly



over the portion of the band lying farther back, a bright silvery-gray shimmer.

This circular band of pigment with its processes represents the ora serrata, which appears more conspicuous than in the divided eye. The silver-gray shimmer perhaps represents the beginning zonula.

The zone peripheral to the ora serrata has a paler choroidal red color than the zone toward the equator. In it are numerous meridional fine irregular yellowish-white stripes. The choroidal vessels run almost exclusively meridionally. They are covered by the pigmented band at the ora serrata, but emerge to view peripherally to the band.

Farther peripherally lies a second stripe of pigment concentric with the equator, which is composed at its margin of small clumps of pigment and then becomes more homogeneous. It exhibits the same variations of intensity of pigmentation as the other stripe, and frequently exhibits also a similar silvery shimmer. From this band of pigment peculiar pronged processes of pigment extend peripherally, showing a parallactic displacement as respects the pigment band. These are the ciliary processes which could be seen in the inverted image almost always if they could be recognized as silhouettes with transillumination.

One difficulty in seeing the ciliary processes lies in the great difference in level between them and the orbiculus ciliaris in the direction of the line of vision, since one must look very obliquely into the eye. After obtaining a clear image of the orbiculus, one sees at first a greatly magnified image of the ciliary processes, and a clear picture is obtained only when the lens is withdrawn farther and thus the field enlarged and the image of the processes made smaller.

In consequence of the great difference in level, the parallactic displacement of the ciliary processes in respect to the orbiculus is greater, the nearer the ciliary processes are to the focus of the lens, and this also at first renders the recognition of the picture difficult.

There is difficulty also when one views parts farther forward, for the root of the iris remaining in the coloboma appears as a dark shadow whose nature is recognized only

when focussing is accurate. The figure on Plate ix. explains these conditions better than a long description would.

Magnus (*Arch. f. Ophth.*, xxxv., 3, 1, 1889), in his paper on the periphery of the fundus, alludes to the ciliary body, but I believe that he has not understood the topographical relations rightly.

In eyes containing a lens I have occasionally been able to see the beginning of the pigmented band of the ora serrata, but never the arcades or the parts lying farther forward. But this is possible, as Magnus's observations show, when the conditions are favorable—the axis of the eye being long or the lens lying far forward.

The ciliary processes, however, can never be seen in the eye containing a lens, this being optically impossible since the lens is attached to them at its equator.

The effect of the width of the pupil in the aphakic eye is shown most clearly when we compare the extent of the field in the region of the coloboma with that where the iris still is present. In the latter case one may see at the most the beginning of the pigment stripe of the ora serrata. Therefore portions of the iris remaining after iridectomy limit the extent of the ophthalmoscopic field greatly.

Like Magnus, I found frequently in the periphery of the fundus changes consisting in more or less extensive choroidal atrophies, and pigmentary changes consisting in rarefaction at some points and accumulation at others. I agree with his view that the frequency of these changes is in direct relation to age and anomalies of refraction. In myopia of high degree focal atrophies of the choroid are rarely absent.

#### *Explanation of the Figure of Plate IX:*

Since it was not possible to give sufficiently the effect of relief when the ciliary processes were drawn in the colors given in the description, they are here represented almost colorless.

## ON INDIRECT RUPTURES OF THE IRIS.

BY DR. GEORG LEVINSOHN, BERLIN.

Slightly Abridged Translation by Dr. WARD A. HOLDEN from the German Edition, XLI., 1, March, 1900, p. 79.

REPORTS of indirect ruptures of the iris, apart from iridodialysis, have been rare. In the last publication on this subject by Weiss and Klingelhöfer (*Arch. f. Augenheilk.*, 1899), the total number of ruptures of the sphincter reported is given as 31, and of ruptures of the continuity of the iris as only 8. It seems desirable therefore to report new cases even for the purpose of increasing the statistics, and particularly because it is believed that ruptures of the sphincter are relatively much more frequent than the number of published cases would lead one to suppose. The views now held as to the mechanism of these injuries particularly led me to go into the matter again. For these views explain so little and are so divergent and even contradictory that they certainly deserve a critical discussion in order to make the matter clearer.

A number of new cases of indirect rupture of the iris follow :

CASE 1.—E. M., aged twenty-nine, complained of mild conjunctivitis. Nine years before a horse-shoe struck the left eye with considerable force. He stated that for the following two weeks he could not see with this eye and was obliged to remain in the hospital six weeks. In both eyes there were residua of trachoma-pannus and white conjunctival scars. The left pupil exhibits on the nasal side and above three small incurvings, in two of which the pigment border of the iris is broken through and in the other



narrowed. The left pupil is slightly larger than the right and responds to light and in accommodation. It dilates after the instillation of cocaine, but the nasal portion remains narrower and irregular in outline. Under eserine it contracts to 1.5 mm and the incurvings then appear as narrow clefts.

Here we have after a contusion of the eye three ruptures of the pigmented pupillary margin, two extending entirely through it, and from the form of the pupil the sphincter has undoubtedly been injured. The dilatation of the pupil so caused is very slight, and sphincter and dilatator exercise their normal function.

CASE 2.—M. A., aged forty-one, a merchant, was struck in the eye by a lead shot from a "catapult." A physician who was at once consulted made instillations and bandaged the eye. Eight hours after the injury we found the condition as follows: moderate ciliary injection, moderate sensitiveness, T — 1; an erosion at the lower margin of the cornea; the pupil of medium width; the iris broader below than above and exhibiting traces of blood. A lead shot 4.5 mm in diameter was removed from the swollen conjunctival sac below. After the instillation of atropine the iris became still narrower above, but did not contract in its lower portion. The fundus was slightly veiled by a pupillary exudation, but exhibited nothing pathological.

The following day the pupillary exudation was partially absorbed and had a gelatinous character. Its upper margin was convex and corresponded to the upper margin of the pupil; the entire mass was of a pale yellow color and resembled a slightly cloudy lens dislocated downward. On the following day the exudation had shrunk considerably and on the day after that it had disappeared. The other inflammatory symptoms passed off and the tension became normal. The retina then appeared to be hyperæmic with many hemorrhages and one circumscribed gray patch upward and outward.

A few days later the iris had taken on a greenish hue, due to the absorption of the blood lying upon it. As a precautionary measure, however, the sideroscope was used, but no movement of the needle occurred.

Two weeks later the appearance of the eye was normal except that the iris remained broader in its lower portion than in its



upper. With oblique illumination one could see near the ciliary margin in the widest portion of the iris several small perforations, four of which looked as if they had been made with a needle and two having more of a cleft shape. It is uncertain whether these perforations had been present some days before, but they did not exist in the days following the injury and probably developed only when the exudation was absorbed. Downward and outward the pigmented margin of the iris was interrupted for 1.5 mm, as was particularly evident when the pupil was small. The fundus changes partly cleared up in two weeks.

Fourteen months later the condition was as follows: Right pupil elliptical, 5 mm in lateral diameter and 4.5 in vertical, while the round left pupil is 4.5 mm in diameter. After the instillation of cocaine the horizontal diameter in the right eye increased to 6 mm and the vertical to 5, while the non-cocainized left pupil measured 3 mm. After the instillation of eserine the horizontal diameter measures 2.5 mm and the vertical 2 mm, the defect in the pupillary margin being very evident. The lesser vertical diameter under all conditions is explained by the diminished retraction of the lower portion of the iris. The changes in the fundus have almost disappeared.

R. with — 1. — 1. cyl V =  $\frac{4}{8}$ ? L. E. V =  $\frac{4}{8}$ ?

This was a case of severe contusion of the eye followed by a slight rupture of the pupillary margin of the iris and multiple perforations of the iris in the region of the dilatator. The former by its effect upon the sphincter caused a slight dilatation of the pupil, and the latter by its injury of the dilatator caused a contraction of the pupil. Hence the peculiar form of the pupil, whose vertical diameter remained equal to that of the other eye while the horizontal diameter became greater.

CASE 3.—T. B., aged forty-two, a roofer, stated that in hammering three days before a piece of slate struck the right eye and that since then his sight had been poorer. Right, slight purplish discoloration and swelling of both lids. A slight abrasion of the skin at the middle of the infraorbital margin. Moderate ciliary and conjunctival injection. Remains of small conjunctival hemorrhages about the cornea. The ciliary region sensitive to pressure. Tn. Cornea clear except for a faint linear opacity

in its centre. The pupil of medium size, slightly elliptic, the long diameter from down and in to up and out being 6 mm, the other 4.5, while the diameter of the left pupil was 3.5. When carefully observed, one could recognize down and out one rupture of the pupillary margin and up and in three ruptures, none more than 0.5 mm deep. With a loupe the pupillary margin here is seen to have an arcade-like appearance, yet the pigment line is completely broken in the lower rupture only, while in the upper rupture a fine brown line preserves its continuity. Moreover, the pupil otherwise is not quite regular but rather wavy in outline. On the anterior capsule, chiefly in the quadrant corresponding to the upper rupture, one sees a number of small points of pigment.

The light reaction is preserved, but is scarcely recognizable. The contraction is uniform at all points. Under cocaine the long diameter of the pupillary ellipse becomes 8 mm, while the short diameter scarcely increases at all. Eserine contracts the pupil and renders it almost round, when three of the upper ruptures become deeper and readily visible. The diameters are 3:2.5 mm. After atropine the pupil becomes somewhat rounder, but the elliptical form is preserved—8:7 mm. When cocaine is added, dilatation increases to 8.5:8 mm. The ruptures are then barely to be made out with the loupe.

In the fundus there is a hemorrhage as large as the disc, and near the temporal margin of the disc. At the nasal margin the retina is cloudy and striated, and the inferior retinal veins are tortuous. Otherwise the fundus, and particularly the macula, is normal.

R — 4,  $\frac{5}{16}$ . Schweigger's test-type 0.6:18 cm p.p.  
— 2. Schweigger's test-type 0.6:30 cm p.p.

Field of vision normal, except for the presence of a small scotoma inward from the blind spot.

In the following days the eye became white and free from irritation, and the sensitiveness to pressure passed off. The mydriasis continued and even increased, so that seven weeks after the injury the pupil measured 6:5.5 mm, the oval shape having become almost round. The light reaction is more pronounced, but still much less than that in the other eye.

R  $\frac{4}{5}$ ? — 0.75,  $\frac{4}{5}$ . Schweigger's test-type 0.6:26 cm p.p.  
— 2. Schweigger's test-type 1.25 cm: 60 cm p.p.

After eserine the right pupil becomes elliptical as before, 3:2 mm.

Only faint traces remain of the hemorrhage near the disc, but now a rupture of the choroid concentric with the disc is seen inward and below the disc.

In this case we found after contusion of the eye:

1. Multiple ruptures of the pupillary margin of the iris with mydriasis which was particularly marked in the direction corresponding to the ruptured parts. Cocaine at first affected the broader portion of the iris but slightly. Eserine, however, affected the entire iris uniformly. Later the iris detracted still more, and the pupil lost its elliptical form and became almost round.

2. Increased accommodation, increased myopia, the near point coming nearer the eye. This condition passed off in the course of seven weeks.

3. Rupture of the choroid.

The literature of indirect rupture of the iris was collected by Franke and brought down to date by Weiss and Klingelhöfer. The first question to be considered is that of the mechanism of this injury.

Franke believed that the force acting upon the eye first produced a spasm of the sphincter and then, through the flattening of the eye, an enlargement of the sclero-corneal ring. The result was the multiple rupture of the tense sphincter iridis.

This view does not correspond to the facts.

Before all it must be remembered that, almost at the same instant in which the force acts upon the eye, the flattening of the eye and the widening of the sclero-corneal ring follow; the difference in time is so slight that both may be considered simultaneous.

This, however, is not the case as respects the contraction of the iris. One may conceive that this occurs in a reflex way after the cornea has been compressed. Therefore it must take place later, long after the sclero-corneal ring has been widened and the iris retracted at its periphery. The production of this reflex requires a small though not negligible period of time, as in the case of the pupillary reaction to light; or the sphincter is excited to contraction as soon as the force acts directly upon it. This moment coincides



with the broadening of the iris ring. But a muscle does not contract immediately upon excitation, for there is a short interval—the so-called latent stage—before contraction begins. The contraction of the pupil, therefore, can only occur after the widening of the sclero-corneal ring has occurred.

Franke's explanation, therefore, is impossible. But even *a priori* it would be difficult to explain the occurrence of multiple ruptures in this way. For with a tense elastic membrane and an outer force acting upon the end which chiefly exerts the tension, the result would be not multiple ruptures but a single gaping rupture which Schirmer believes should not be perpendicular to the pupillary margin, but parallel to it.

Weiss and Klingelhöfer also object to Franke's view, although they admit as a possible point in its favor the fact that in Clark's case the rupture of the iris corresponded to an opacity of the lens more centrally located.

A similar condition existed in our Case 3, a bit of pigment that had been thrown off lying in the centre of the pupil and at some distance from the pupillary margin. But this condition is not extraordinary. One might conceive that the pupil at the time of the contusion was greatly contracted, since these injuries usually occur in bright daylight and when the patient is at work — light and accommodation making a small pupil probable.

Schirmer believes that the trauma forces the cornea backward so that it holds the sphincter fast and the forcing out of the aqueous ruptures the iris. Weiss and Klingelhöfer show that this hypothesis will not explain the cases in which the rupture is opposite the direction of the force and that it is untenable in cases in which the margin of the cornea or the sclera has been struck. Furthermore it is very questionable whether the cornea is forced back until it comes in contact with the lens capsule. Indeed, it is almost impossible.

Fuchs's view, that when the contusion occurs the aqueous humor principally enlarges the sclero-corneal ring and thus ruptures the sphincter by rendering it over-tense, is objected to by Weiss and Klingelhöfer, who state that this explanation could hold good only in cases in which the force acts



upon the cornea from directly before. According to their opinion, there is no great difference between the view of Fuchs and of Franke since each explains the rupture of the sphincter by supposing that it is rendered over-tense.

But in fact the explanation given by Weiss and Klingelhöfer differs but little from the others, since they regard the rupture of the sphincter as being due to over-tension of the sphincter, manifested in a direction perpendicular to the striking force.

In order to understand the production of indirect ruptures of the iris one must analyze the forces at work in cases of contusion. We may consider the anterior chamber as a basin with elastic walls containing water. For, indeed, the increased tension of the aqueous caused by the injury forces the iris so tightly against the lens that the iris and anterior capsule of the lens form a posterior wall to the basin. If pressure is exerted upon such a basin it acts in two manners: first, it flattens the basin and enlarges its limits, and second, its force is transmitted to the aqueous. The first factor has been held by all authors to account for the indirect ruptures of the iris, while the second factor has usually been neglected. Yet it is of great importance.

Franke has used it to explain rupture of the choroid, but has not mentioned it in connection with rupture of the iris, which seems strange. When water in a closed basin is subject to a considerable sudden force, the non-compressible water seeks to escape along the easiest channels and thus works great damage in the least resisting parts, particularly the pupillary margin. Another portion of the iris of slight resistance is the ciliary attachment, where injury is most frequent in cases of contusion. Arlt's explanation of iridodialysis, that the iris is unable to follow the sudden widening of the sclero-corneal ring and therefore is torn, has little probability, for not only is the sclero-corneal ring widened, but the pressure of the aqueous widens also the iris attachment. The fact that the periphery of the iris is not supported by the lens, and therefore is forced backward by the aqueous, does not explain iridodialysis, but renders comprehensible the invagination of the iris described by Foerster.

The main factor in the development of iridodialysis is the ease with which the iris may be torn at this place, where it is thinnest. When the tissues of the iris are altered, rupture may occur at unusual points, as in the following case.

CASE 4. A laborer nearly sixty years old had had several attacks of iritis in each eye. With one eye he could only count fingers near-by, there being complete occlusion of the very small pupil. The central portion of the anterior chamber alone remained, the peripheric portion being obliterated. Tension was increased, and the eye injected. The iris was atrophic, particularly below. Because of the severe pain an iridectomy was attempted. It was only possible to remove some peripheric bits of the iris and the pupil was drawn upward. The result was unexpectedly good. The pain ceased, the tension fell, and vision improved, due to the fact that the iris had ruptured in its most atrophic portion, near the lower ciliary margin, and a new pupil was thus formed.

This example shows the great importance of the condition of the iris in respect to ruptures of it, the diminished resistance of certain parts of the iris explaining why in cases of indirect rupture principally the ciliary margin, and, next the pupillary margin, and rarest of all the body of the iris, is affected.

There still remains the question whether the rupture occurs in the direction of the force or perpendicular to it. Franke and Weiss and Klingelhöfer accept the former view. But in our Cases 2 and 3 we found that the rupture of the iris took place directly opposite the action of the force. In the cases of Blank, Clark, and Kazaurow also the site of the rupture corresponded to the direction of the force. However, it is well known that indirect fractures of the skull may lie not only in the direction of the force but also perpendicular to it, and this may also be the case with the eye.

The condition of the pupil is also of interest in these cases of indirect rupture. The condition differs according to the time that has elapsed since the injury. But one can say that in almost every case the pupil is dilated immediately after the injury and then in the course of time gradually

becomes smaller, although some dilatation remains. From this we may conclude that the rupture of the sphincter causes only a low degree of mydriasis, and that the immediate dilatation is chiefly due to paralysis of the sphincter, as in the cases of traumatic mydriasis in which there is no rupture.

Frequently there is also a paralysis of the dilatator and according as one or both muscles are involved there is mydriasis or myosis. Usually there is a temporary paralysis of the sphincter, while the dilatator is involved but slightly if at all. Tests of the pupillary reaction give us the most information in this respect.

The nerves supplying the sphincter are paralyzed by atropine and excited by eserine, and a weak cocaine solution excites the nerves supplying the dilatator. Thus in our Case 3 we had, besides the rupture of the sphincter and the apparent paralysis of the sphincter, also an involvement of the dilatator, since cocaine has almost no effect upon the horizontal diameter of the pupil. The fact that the vertical diameter of the pupil remained the greater both before and after the instillation proves only the greater injury of the sphincter ruptured at this point and the predominancy of the weakened dilatator over it. Later, when the dilatator had recovered, the pupil became wider in the horizontal diameter also, thus making evident the predominancy of the dilatator on all sides. The dilatation of the pupil can be caused not only by the local rupture of the sphincter, but also in part by a general paresis of the sphincter, for otherwise with the demonstrated paresis of the dilatator there would be in the beginning a narrowing of the pupil which at the most, as the reaction to eserine shows, would give place to a slight dilatation in the vertical diameter. We may suppose, however, that, as the paresis of the dilatator passes off in time, gradually the general paralysis of the sphincter is recovered from and the final result, as in our first and in other cases, would be only a slight dilatation of the pupil corresponding to the small ruptures of the sphincter.

Case 2 is characteristic in that, besides the paralysis of the sphincter and the injury of the sphincter through which



a dilatation of the pupil is brought about, there is also a greater injury of the dilatator. Since the effect of the dilatator is wanting at this point, the iris here is considerably broadened. This is most clearly manifest after the instillation of atropine. While the paralysis of the sphincter passes off completely in time, the iris remains broader at this point in consequence of the persisting injury of the dilatator. The result is a pupil broader in the diameter perpendicular to the injured portion of the iris than in that corresponding to the injury of the sphincter and dilatator.

If the paralysis of the sphincter is very marked, as is usually the case in the days immediately succeeding the injury, eserine will not cause the sphincter to contract.

In Meyerhöfer's case eserine has scarcely any effect upon the size of the pupil.

Very peculiar is the explanation of Weiss and Klingelhöfer of a case of traumatic mydriasis, in which eserine in the first days after the rupture of the sphincter caused a marked mydriasis and later myosis. These authors believe the peculiar condition of the pupil to be due to the fact that the shortening of the sphincter when ruptured must cause a dilatation of the pupil and that the reaction to eserine returns after cicatrization. In opposition to this we may say that pupils, when the sphincter is ruptured, are not accustomed to dilate after the use of eserine, as can be seen after iridotomy or iridectomy, and further that, if the supposition of Weiss and Klingelhöfer were correct, it would be impossible to have a contraction of the pupil later. For granted that the connective-tissue bridge caused the approach of the ruptured ends of the sphincter, the connective-tissue band would at once relax and the sphincter act as Weiss and Klingelhöfer suppose, and the pupil become dilated.

The explanation of the dilatation of the pupil in the early days when eserine is used really presents no difficulties. In all probability in these cases there is at first a paralysis of the sphincter with interference with the dilatator. The latter, as we have seen, generally is soon recovered from. Thus we see in the case of Weiss and Klingelhöfer that with increased tone of the dilatator muscle the pupil dilates.



Since the sphincter is still completely paralyzed, it is not in the least affected by the instillation of eserine, and the dilatation under eserine is apparent rather than real. Later when the sphincter regains its function eserine acts as usual and contracts the pupil.

We shall not discuss the question whether there may be paralysis of the dilatator without paralysis of the sphincter. *A priori* it would seem possible.

Before concluding I should like to add an interesting case, which shows that there may be defects of the iris giving one the impression of being due to trauma, but not being of traumatic origin and probably being congenital.

CASE 5.—W. T., a merchant, aged forty-seven.

Excessive myopia in each eye.

R with  $-25$  D,  $V = \frac{4}{25}$ ; L with  $-26$  D,  $V = \frac{4}{16}$ .

In each eye annular posterior staphyloma and central chorioretinitis.

The right eye is said to have had iritis fifteen, ten, and nine years before, but the pupil is round and responsive and there are no traces of posterior synechiæ. It was said that previously there had been detachment of the retina, but now it is everywhere adherent to the choroid.

Both irides present a remarkable condition. First, there were numerous more or less pronounced interruptions of the pigment border, some of which had the appearance of the ruptures of the sphincter seen in the other cases. Second, there was in each eye a larger defect extending at least  $1\text{ mm}$  into the iris, mostly filled with a gray membrane, and easily visible to the naked eye. In the right eye this cleft lay in the centre of the lower margin of the pupil and had the form of an equilateral triangle, the base of which formed the pupillary margin. In the left eye the cleft lies in the lower-inner quadrant and has the appearance of a rupture which is rather broader at the pupillary margin. There is isocoria and the pupillary reaction is equal on both sides and entirely normal.

These changes in the iris might be mistaken for typical injuries, yet neither eye had ever been injured. The changes in the right iris could be attributed to the previous iritis, if

one assumed that the excessive retraction of the pupillary margin might bring about the injuries. But, on the contrary, we know that ruptures of this sort have never been seen in iritis, that no evidences of previous adhesions are present, and that the same changes are found in the left eye, which had never suffered from an inflammation. One cannot regard these changes then as other than congenital, although it is not possible to say exactly how they arose.

The following conclusions may be drawn :

1. Changes in the pupillary margin of the iris altogether similar to those following contusion of the eye may be found without any preceding injury and are probably of congenital origin.

2. The indirect injuries of the sphincter and of the iris in general are in consequence

(a) of the flattening of the anterior chamber and the rupture of its elastic walls thus brought about ;

(b) of the pressure of the aqueous humor exerted equally in all directions.

3. According to their liability to rupture and their respective elasticity, various portions of the iris are injured with different frequency.

The series is : (a) ciliary margin, (b) sphincter, and (c) the iris proper.

4. Whether the injury occurs on the same side as the trauma or on the opposite side depends on whether the iris offers greater resistance to bursting or to bending. It would seem that the ruptures by bursting are more frequent.

5. The changes in the form of the pupil are the result of the injury to the iris and the paralysis of the iris muscles. Usually there is a marked paralysis of the sphincter and a less marked transitory paralysis of the dilatator. Ruptures of the sphincter in themselves cause only a low degree of mydriasis.

## ON THE ANATOMY OF THE GANGLION CELLS OF THE RETINA.

BY DR. G. ABELSDORFF, BERLIN.

(*With eight figures on Plate XI. of Vol. XLII., German Edition, Nov., 1900.*)

Translated by Dr. WARD A. HOLDEN.

A FEW years ago the histological study of the relations and connections of the elements in the central nervous system was so general that little attention was paid to the finer structure of the elements themselves. This course was favored by the Golgi method, which stained the ganglion cells black, and so prevented any study of the cell-body itself. As is usual in histological investigation, advances came with newer technical methods which gave a representation of the inner structure of the ganglion cell. Nissl is chiefly responsible for the new movement, and now the ganglion cells are a favorite field for those studying the histology of the nervous system. A great number of reports have appeared in recent years on the normal and pathological anatomy of the nerve cells, and although the newness of the work precludes final conclusions, and perhaps many of the results obtained will not stand critical controls, still our knowledge has been so increased that we may apply it to the nerve cells of the different organs and to the eye. In ophthalmology, also, the interest of the principal investigators tended toward the connections and branchings of the nervous elements. The brilliant results of such study are best seen in the works of Ramón y Cajal, in

which he traced the tracts conveying the light excitations in the retina.

A detailed report on the structure of the retinal ganglion cells themselves as revealed by Nissl's method was first furnished by Bach, who studied particularly the changes which take place in the ganglion cells after detachment of the retina.

Nissl himself spoke of the importance for pathology of studying the cells of healthy animals, and I wish here to cover a small section of this large field and show by several examples that in the different animals the ganglion cells of the retina differ not only in size but also in structure; which is a further reason why changes obtained experimentally in the cells of one animal should be only reservedly considered to hold good for other animals.

Bach remarked that the arrangement and form of the plasma granules differ in different species of animals, and that it is not improbable that within certain limits differences may be found at different ages.

The essentials of the Nissl method are as follows: The organ is fixed in 96% alcohol, the sections stained in alkaline methylene blue, differentiated in anilin-oil alcohol, and mounted in benzine-colophonium. In nerve cells so treated one can distinguish a formed substance, staining with the basic anilin dye, and an unformed substance. The former appears as bodies of various forms known as Nissl granules, which in a particular cell have a particular arrangement, so that there is offered the possibility of a morphological classification of nerve cells.

In order to study the retinal ganglion cells I fixed retinas in 96% alcohol, cut them in paraffin, and stained them according to Nissl's original directions, and also with saturated aqueous solutions of thionin and toluidin blue after bichloride fixation.

A method equally useful and more simple is that of Rosin, who stained formol sections of the spinal cord with Ehrlich's neutral red. After differentiating with absolute alcohol, the Nissl granules appeared red, the intermediate substance and the nucleus yellow, while the cell membrane



and the nucleolus appeared red. In this manner one obtained a double stain, the basophilic substances appearing red, and the acidophilic yellow.

In order to make retinal preparations after this method, I hardened the eyeballs in 96 % alcohol or 5-10 % formol. Fixation with alcohol causes folding of the retina, and the preservation of the rods and cones is unsatisfactory, but excellent pictures of the ganglion cells are obtained. Fixation with formol prevents the folding of the retina, and the ganglion cells seemed to be as well preserved as in the alcohol preparations, except that the reticulum of the nuclei was less clear.

After hardening the eyeballs in alcohol or formol, the retinas were detached, saturated with chloroform, and imbedded in paraffin. Celloidin preparations, however, take the neutral red stain equally well. The sections 5-10  $\mu$  thick were floated on the slides in distilled water and fixed, the paraffin was removed, and the specimens lay  $\frac{1}{2}$ -24 hours in a saturated solution of Ehrlich's neutral red. Overstaining does not take place, but the longer the stain acts the more intense is the yellow coloring of the interstitial acidophilic substance. The superfluous stain is removed by careful washing with distilled water, the sections are dehydrated and at the same time differentiated in absolute alcohol free from acid, cleared in xylol, and put up in xylol-Canada balsam. The preparation and staining of the section are no more difficult than when the ordinary hematoxylin is used. And so far as I can judge, from preparations made a year ago, the stain is well retained, as is shown in the figures on Plate xi., which were drawn from these year-old preparations. The Nissl bodies are actually red, and the intermediate substance is pale yellow and exhibits no fibrillar structure, although this may exist and yet not be revealed by the stain.

I shall begin with the retinal ganglion cells of the frog. Manz has already called attention to the similarity that exists between the ganglion cells and the cells of the inner nuclear layer in the frog. He describes the cells as being pear-shaped, with a long or short stalk. He continues:

"The body of the cell consists of a moderately fine granular mass with a sharp contour, outside of which is frequently found a second delicate membrane. Within the finely granular protoplasm one usually finds a large clear granule, sometimes central, often excentric, which represents the nucleus of the cell, for in the frog I have never found a vesicular nucleus such as is present in other ganglion cells, although this granule corresponds in size rather to a nucleolus than to a nucleus. The stalk of the cell narrows down and passes over directly into the long process where the granular structure ceases and the refraction changes."

According to our present-day conceptions, we must say that all the characteristic components of the ganglion cell are present in somewhat modified form. The protoplasm is but slightly developed, the nucleus is large and vesicular (described by Manz as protoplasm), and constantly contains a nucleolus (described by Manz as a nucleus). Manz's error consisted in mistaking the large nucleus for the protoplasmic cell body, which in reality is attached to the nucleus. The actual conditions can best be made out in fresh preparations stained with Ehrlich's methylene blue. The retina of a freshly killed animal is spread out on a slide with the nerve-fibre layer up, and upon it is dropped a  $\frac{1}{16}$  % methylene blue in physiological salt solution. After half an hour the cell protoplasm stains blue, while the large nucleus remains pale and the nucleolus stain dark.

A cell fixed in alcohol and stained with neutral red, which has a relatively large protoplasmic body, is shown in Fig. 1, Plate xi. Such cells are much less frequent than those with still less protoplasm (Fig. 2). Between the two are transition types and also cells with so little protoplasm that they are with difficulty distinguished from cells of the inner nuclear layer. In regard to the finer structure, one sees in Fig. 1 Nissl granules of small size and fairly constant form scattered regularly through the cell body, except for some larger bodies containing vacuoles, and lying near the nucleus. The beginning of the axis cylinder is free from Nissl granules, and the single nucleolus appears homogeneous.

The cells with rudimentary bodies (Fig. 2) contain only a

few Nissl granules in the periphery and near the nucleus, while the nucleus is not homogeneous, but contains many granules of chromatin.

According to Nissl's classification of ganglion cells into those with large bodies surrounding the nucleus (somatochromes), and those in which the cell body is subordinate to the nucleus (nucleus cells), we have in the frog's retina particularly cells of the latter type.

In their structural differences they form an interesting confirmation of what Levi found to hold good for nerve cells in general: The formation of chromatophilic substance (Nissl's bodies) is only well marked in the somatochromic nerve cells and slight in the nucleus cells and granules. The greatest lack of chromatin or nuclein, however, is found in the most fully developed nerve cells.

I have examined also the retina of the toad and of the lizard, and have found the retinal ganglion cells similar to those of the frog.

In the perch and in the pike the cells are quite different. The elongated cell body surrounds the globular nucleus on all sides, and the cell is therefore of the somatochrome type. When stained with neutral red the entire cell-body is closely and uniformly filled with granular or rod-shaped bodies, while the small intervening spaces are occupied by the yellow-colored ground-substance. In Fig. 3 one sees how the bodies extend continuously into the processes of the cells, excepting the beginning of the axis cylinder, which remains free. In the nucleus lies the dark-red nucleolus, and in the perch I sometimes found a double nucleolus.

The ganglion cells of the birds (Fig. 4) that I examined (an owl, *Athene noctua*, and pigeons, *Columba livida* and *risoria*) had a less regularly granular appearance, and resembled more the *tigré* appearance found in the mammalia. The cells in the owl are larger than those in the fishes examined, and the chromatophilic bodies are in general larger, polymorphous, often triangular, and irregularly distributed. In these also the axis cylinder, unlike the protoplasmic processes, is free from the bodies. In the yellow ellipsoid nucleus, surrounded by a smooth membrane, are some spots of reddish-colored



chromatin. The nucleolus is round and of homogeneous red color. That these cells are larger than those in the other animals described, and also contain the largest Nissl bodies, is merely accidental rather than the expression of a general law. The ganglion cells in the pigeon's retina are smaller than those in the owl, their structure is analogous, but the Nissl bodies are at least as large, if not larger.

The somatochrome type of nerve cells of the retina is most beautifully developed in the mammalia.

Fig. 5 represents the ganglion cell of a dog. The Nissl bodies fill the cell body compactly, and are mostly of polygonal form. Some of them have fine processes and irregular outlines. A small zone about the nucleus is often free from Nissl bodies. In the protoplasmic processes the Nissl bodies assume a long spindle shape, with the long axis parallel to the axis of the process. The round nucleus contains but small masses of chromatin and a single large nucleolus.

Fig. 6 represents a cell of similar structure from the rabbit's retina. The similarity to the spinal ganglion cell is less marked than in the dog, but the type is essentially the same. Good representations of the cells in other animals, such as the cat, pig, and calf, are to be found in the papers by Bach and others. The difficulty in obtaining fresh human eyes explains the fact that I have represented but one cell from the periphery of the retina, and have not taken into consideration the regional differences in the cell. Fig. 8 is from the eye of a man, fifty years old, which was enucleated on account of a tumor of the upper jaw and fixed in 10 % formol. The greater portion of the eye was used for other purposes.

One sees very clearly in Fig. 8 the beginning of the axis cylinder free from Nissl bodies; the individual bodies are smaller than in the dog and rabbit, and some lie directly upon the membrane of the nucleus, but in general the zone about the nucleus is free. In the slightly oval nucleus lies a dark, not absolutely round, nucleolus.

Since the introduction of the modern delicate methods of technique, the question has arisen whether the function of the cells is expressed in their morphology, so that rest and



fatigue give rise to different appearances. My experiments on rabbits, like those of Bach's, were negative, and the results did not agree with the reputed positive results of Mann on dogs and Pergens on fishes.

A point to which I should like to call attention is the difference in the ganglion cells of full-grown rabbits and those three or four days old. The young rabbits are doubly blind since the palpebral aperture is closed and the rods and cones are not developed. The ganglion cells, however, are well formed with nuclei and nucleoli, but they are not only smaller than those in the grown animal, particularly as regards the cell body, but they also exhibit a different arrangement of the Nissl bodies. The latter are not regularly distributed through the cell body, but are collected at particular spots, leaving others free. They lie particularly in large clumps between the nucleus and the periphery of the cell.

Although Nissl himself stated that the stained cell was only an equivalent of the living cell, *i. e.*, that it had not the actual appearance of the living cell, but under particular conditions it formed a constant microscopic picture, nevertheless the question has been much discussed whether the Nissl granules are to be seen in the living ganglion cell. This question can be better decided as regards the retina than as regards the spinal cord, because one can study the retinal cells in position without having disturbed them much. Held, who believed that the Nissl bodies were precipitated by the fixing agents, and were present in the living cells in a liquid state, regarded the pictures obtained by the Nissl stain as showing us the internal metabolism of the cell protoplasm in a certain manner modified by fixing and staining processes, and thus gave us in every case a representation of the active material in the interior of the cell. In regard to the appearance of fresh cells in the anterior horn of the cord, he says that one finds a lustrous gray nucleolus with some vacuoles, a homogeneous glassy transparent nucleus with a double contoured limiting membrane, and a more lustrous protoplasm with a few dark granules. This is all that can be observed.

When one spreads out the retina of a freshly killed rabbit with its inner surface uppermost upon a slide, he sees with an immersion lens no more and no less than Held saw in the cells of the anterior horn. In the remarkably transparent cell-substance lies here and there a little granule; the margins of the wholly transparent nucleus are represented by a membrane, and in the nucleus lies the more lustrous nucleolus. A fibrillar structure such as Schultze pictured in the fresh ganglion cells of the ora serrata in the ox, but did not find in the macular cells in man, could not be found in the cells of the rabbit. Schultze speaks of the fibrillar structure of the retinal cells with great reserve: "The cell substance is probably fibrillar and contains also an interfibrillar granular substance, but the transparency of the cells in life is so great and the fibrillæ so fine that the picture is much less clear than that of the spinal cells." He speaks of coarse granules appearing in the dead retinal cells, and I could see plainly in the rabbit's retina that after the cells were dead polymorphous, opaque formations appeared which greatly resembled the Nissl bodies. From these observations, as Flemming stated in discussing Held's investigations, one cannot be positive that the Nissl granules are not present in the living ganglion cells, but only that they are not visible. There are other histological examples, as Flemming stated, which show many things in the cells which are invisible in life, not "biophaous," but still are vitally preformed.

#### EXPLANATION OF THE FIGURES ON PLATE XI.

Figures 1-7 are from paraffin preparations, 8 is from celloidin. All are stained with neutral red. Zeiss  $\frac{1}{2}$  in. Oc. iv.

Figs. 1 and 2.—Ganglion cells of the frog's retina.

Fig. 3.—Ganglion cells of the perch's retina.

Fig. 4.—Ganglion cells of the owl's retina.

Fig. 5.—Ganglion cells of the dog's retina.

Figs. 6 and 7.—Ganglion cells of the grown and of the three-days-old rabbit respectively.

Fig. 8.—Ganglion cells of the human retina.

# A CONTRIBUTION TO THE DIFFERENTIAL DIAGNOSIS BETWEEN GLIOMA OF THE RETINA AND PSEUDOGLIOMA.

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Translated, by Dr. WARD A. HOLDEN, from Vol. XLVI., 2 (1902), of the  
German Edition.

IN the early years of childhood, glioma and the cases designated by the collective name "pseudoglioma" are fairly frequent. Many statistics have been published, of which Wintersteiner's is of most value. He found in 498,057 patients 203 cases of glioma, or 0.04 %. The percentages found by Hirschberg, Fuchs, and Freudenthal are 0.01 % higher. The still higher percentages of Pflueger, Holmes, and Vossius may be explained by the fact that to obtain reliable statistics of diseases which are rare and not easily diagnosed an extensive material is necessary. In the eye department of the Buda Pesth hospital, among 56,839 cases seen in nine years, there were six cases of glioma, a percentage of 0.01.

As opposed to these figures, Mohr diagnosed in the Bródy-Adel children's hospital eight cases of glioma in 5164 patients, and in seven an operation permitted the confirmation of the diagnosis. This high percentage is due of course to the fact that all his patients were children. Among 2319 patients that I have treated in the municipal hospital, only one case of glioma was found, or a percentage of 0.04. Thus the frequency of this affection varies, according to the age of the persons from whom the statistics are derived.

There are no satisfactory reports as to the frequency of the cases collectively known as pseudoglioma, yet, according to



my experience, they are frequent. Only cases should be considered in which the eyeball has been enucleated under a wrong diagnosis, and when opened found to contain not a tumor but the products of chronic inflammation.

The frequency of such cases is shown by the following statements. Raab found in O. Becker's great collection twenty eyeballs enucleated for glioma, of which eight exhibited merely signs of inflammation of the uveal tract. Vetsch collected twenty-four cases of glioma, in which a wrong diagnosis had been made in two, while in one a diagnosis of cicatricial formations after irido-choroiditis was made and when the eye was opened a glioma was found. Treacher Collins reported on 1024 eyes enucleated in the course of four years at Moorfields, with the diagnosis glioma in twenty-four cases, in seven of which it was wrong. Isler collected the cases of glioma seen at the Basle clinic. In three, operation was refused because the affection was bilateral, and in two an error was made, one case being tuberculosis and the other iridocyclitis with detachment of the retina. In twelve other cases the diagnosis was confirmed histologically.

Goldzieher designated as cylindroma one sort of pseudoglioma. Pinto da Gama found in one case a detachment of the retina with organization of the vitreous when ophthalmoscopically there had been seen a yellow floating tumor. Panas observed in three new-born infants detachment of the retina, due to intra-uterine exudative cyclitis, in which the ophthalmoscopic picture was altogether similar to glioma.

One distinguishes four stages in the development of glioma or neuro-epithelioma of the retina. In regard to the differential diagnosis, only the first two stages need be taken into consideration, for, in fact, it is only in the first stage that the diagnosis may be difficult. When inflammatory signs with increased tension come on, the malignancy is assured.

In the first period—that is, during its intraocular growth—the symptom of the yellow reflex from the interior with complete amaurosis is the chief characteristic, and gave rise to the old name “amaurotic cat's eye.” The tint and the hue of the reflex depend upon the transparency of the refractive



media, the size and location of the tumor, and various minor conditions. When the tumor pushes the retina forward before it, the color may be white or bluish-white. When the diagnosis rests upon the ophthalmoscopic examination only, an error is easily possible and only the further observation of the case will reveal its true nature.

The cases which give rise to error can be grouped according to Wintersteiner into two classes.

1. Cryptoglioma, in which an existing tumor cannot be diagnosed on account of accompanying symptoms. Schöbl invented this name and described cases in detail.

2. Pseudogliomas in which inflammatory changes exist in the eye and lead one to suspect glioma.

Tumors are unrecognizable in all cases in which opacity of the cornea, lens, or humors renders illumination of the fundus impossible. In doubtful cases of this sort Blumenthal made an iridectomy in order to see the tumor through the coloboma. Greene, in a similar case, extracted the lens, in order to get an idea of the contents of the eye. A tuberculous tumor of the ciliary body extending into the anterior chamber also may give rise to confusion.

But more frequently other affections of the eye are mistaken for glioma. Among these are detachment of the retina, and sarcoma and tuberculoma of the choroid. Apart from the fact that these diseases are rare in childhood, detachment of the retina has characteristic differentiating symptoms, such as the bluish-gray color of the detached retina, the floating of the membrane, the regular branching of the vessels, and the diminished tension of the ball. The diagnosis of the two other diseases is not difficult.

As pseudoglioma proper, however, we designate that group of cases in which the yellow reflex appears and the eye becomes blind in consequence of chronic inflammation of the choroid or ciliary body. The inflammatory product becomes organized in the vitreous and causes detachment of the retina. In such cases the history is of especial importance.

This disease in the child begins usually but not always with inflammation and pain. The eye is irritated and there is photophobia. The color of the reflex is a metallic yellow. The

exudation contains no vessels, while a tumor is rich in them. The surface of the exudation is smooth, that of the tumor nodular. All this cannot be considered a definite rule since there are many exceptions. The most important point is that the tension in cases of tumor is normal at first and later becomes increased, while in cases of exudation tension is diminished, particularly in the later stages when atrophy and retraction begin. Wetsch considers ectasia of the cornea characteristic of glioma, although this symptom, as well as increased tension, may also be present in plastic and tuberculous inflammations of the choroid, as is sufficiently proved by Brailey's case. Saemisch mentions a case in which the increased tension was caused by detachment of the retina, purulent choroidal inflammation, and connective-tissue degeneration. The presence of synechiæ also indicates inflammation.

These symptoms, however, are sometimes so confusing that the transition stages become unduly prominent and the most skilled diagnostician may find himself at fault.

Purulent inflammation of the vitreous, cysticercus, and opacities of the vitreous that become organized may also lead to wrong diagnoses.

In the following lines I wish to report a case which seems of importance in many respects. Particular interest attaches to the condition of the blinded eye and the ophthalmoscopic picture in the other eye, while the connection of these two pathological states is instructive. Still more interesting is the fact that the most skilful oculists could not make an absolute diagnosis at the beginning of the disease and its true nature was only revealed by further observations.

*August 13, 1900.*—I saw a girl, aged four, whose mother stated that the child squinted with the left eye, was unable to see with it, and for six weeks she had observed at times a yellow reflex from the interior. At the age of six months the child had had an external inflammation of the eye which under a bandage healed in a few days. From the family physician I learned that the child was born at the seventh month, weighing sixteen K, and developed very slowly; at the end of the first year of life marked craniotabes and in the course of the second year rachitis. The child learned to

sit up very late, learned to walk and speak only in the third year, and the psychical development was so slow and incomplete that the child now is an imbecile and the gait still uncertain. Manifest symptoms of hydrocephalus were never present, but the architecture of the skull was similar to that observed in cases of hypertrophia cerebri combined with rachitis. The child had had no particular organic or infectious diseases except an inflammation of the lungs in July, 1901. It may be mentioned as a curious fact that, in eating, the child chewed its food sometimes for a quarter of an hour before swallowing it. Alimentary tract in a healthy condition. The father was diabetic at the time of generation.

The examination of the eyes gave the following results: The right eye recognized at a distance of 4 *m* objects corresponding to the intelligence of the child; the left eye was blind and squinted in. With the child in the right position the yellow reflex from the left eye could be observed at a distance of 2 *m*. With the ophthalmoscope the same reflex was seen, and it was found that the retina was detached and at many points floating. In the upper portion of the fundus atrophic spots as large as the disc were seen partly surrounded by pigmented borders. The eye was free from inflammation, the tension normal. The condition of the other eye was of interest, but here one could gain only an approximate idea of the amount of vision. The entire fundus was filled with atrophic foci of different sizes which involved the choroid as well as the retina. The refractive media were clear in both eyes.

The conditions found in the left eye would have led me to make a positive diagnosis of glioma had it not been for the atrophic patches in the right eye, which suggested a chorio-retinitis in both eyes producing a tumor in the left.

The clinical picture soon changed. Three weeks later the eye began to tear and there was photophobia. Tension increased to + 1, but there was no pain. The pupil had become dilated, but other evidences of glaucoma were wanting. I then began to yield to the opinions expressed by other ophthalmologists and advised the enucleation of the eye. The parents, however, resolved first to consult Professor Fuchs in Vienna, to whom my history of the case was sent. He examined the child in narcosis in October, 1900, and expressed the following opinion: "The yellowish-white patches in both eyes seem to me the beginnings of glioma, particularly since the tension has become increased in the left. The



diagnosis is not, however, absolutely certain. I would advise, therefore, tonic treatment and further observation.

Some weeks later the eye became softer and the ciliary injection disappeared without any therapy. The ophthalmoscopic picture remained approximately the same. The child went through the winter very well, and developed properly. In May, 1901, Professor Fuchs saw the child again and assured the parents that there was no glioma. In July, 1901, I had another opportunity to examine the child. The eye was quiet, the tension normal, the yellow reflex paler, and the tumor atrophied and smaller. The other atrophic portions of the fundus had become paler. The condition of the right eye remained the same except that the yellowish-white patches had become whiter.

This was a case in which the diagnosis was all-important. What have we to guide us in such cases?

Glioma often is bilateral. According to the statistics, both eyes are affected in twenty per cent. of the cases. The tumor may appear simultaneously in both eyes, or the second eye may become involved months or years after the first. The two growths, however, are independent and primary, never metastatic, growths.

When the growth appears in one eye only, the other eye may be lost from changes which are but indirect consequences of the tumor. For example, when the growth extends from one eye to the other, displacing the eyeball or destroying the optic nerve by compression, as in the case described by Midellemore, Glaser observed hemorrhagic neuro-retinitis in the second eye five years after the enucleation of an eyeball containing a glioma. Other authors describe changes which have no relation whatever with the tumor, such as panophthalmitis and scars of the cornea.

A. Graefe stated that glioma developed in the form of white plaques of different sizes scattered over the retina, which differed from infiltrations of the retina in form, opacity, and grouping. They lie sometimes beneath and sometimes above the retinal vessels and early project into the vitreous cavity. Then the retina becomes detached gradually and the tension becomes increased. Most authors—Hirschberg, Schöbl, Perles, Jodko—describe the development



of glioma in the same manner, and all allude to the white color of the plaques, their prominence and location, and the bending of the vessels. To this clinical picture are added detachment of the retina, opacity of the vitreous, and increase in tension.

When we compare the changes in the right eye with these observations, it is at once noticeable that the yellowish-white plaques in the retina were not elevated, that they were often surrounded with pigment, that they did not form groups, but were scattered over the fundus near the disc, that the vessels were not bent in passing over them, and particularly that in the course of a year and a half they did not increase, but, on the contrary, became paler and whiter.

Pigment formation does not occur in glioma. Graefe even maintained that pigment was not found in the cases in which secondary metastatic nodules formed in the choroid, although pigmentation is the chief characteristic of choroidal tumors. Gliomas become colored only through hemorrhage, and then they become brown. Wintersteiner in his monograph cites Hoach's case, in which in the eye free from tumor a number of irregular white patches, surrounded by a pigmented margin, were found about the posterior pole. These at first glance appeared to be patches of choroiditis, but when closely examined they were found to be elevated. Glioma was present in both eyes in this case, and the child died in six months. I have not been able to find in the literature another case of undoubted glioma in which there was pigmentation. The elevation of the patches is of diagnostic importance.

My case was under my observation for a year and a half without further changes taking place in the eye or other organs becoming affected. The spontaneous duration of glioma is known to be a year and a half—rarely more. In the literature there is a single case recorded in which death occurred after twenty-three weeks.

In regard to the length of the first stage, the period before glaucoma develops, there are recorded histories of 81 cases, from which it appears that in 19 cases the first stage lasted one to five years, in 35 cases six months to

one year, and in 27 cases six months. It should be remarked, however, that the first stage lasted two to five years only in cases in which the disease was discovered in the first weeks of life, the condition being congenital. In the great majority of cases the development of glaucomatous symptoms required less than a year.

Hirschberg has operated on 17 cases, and from his own experience concludes that three months after the appearance of the yellow reflex the prognosis of the operation is bad.

These facts also speak against the diagnosis of glioma in my case.

Confusion and errors in the diagnosis of glioma cannot be avoided, and hence I mentioned in the beginning of this paper the conditions found by various writers when the eyeballs were opened.

It is certainly a blunder to enucleate a blind, non-inflamed eye, believing that a tumor was present. Yet such things happen, and even both eyes have been enucleated and found to contain pseudogliomas only (Allin-Delafield).

The diagnosis in my case was difficult, almost impossible. I, myself, believed from the first that the primary condition was a chorio-retinitis, which in the left eye was combined with exudation and partial detachment of the retina. Some cases of this sort have been reported. Schick presented at the meeting of the German Ophthalmological Society in 1900 the histories of two young healthy persons who had prominent masses between the choroid and retina. In one case the mass resembled a glioma, but no change in its appearance occurred in a year and a half. Schick considered them cases of fibrinous exudation.

I was somewhat shaken in my belief by the increase in tension and the views of Professor Fuchs, but the tension soon diminished, and the course of the affection assured me of the correctness of the diagnosis. Whether these changes had any connection with the rachitis I am unable to say, but I have not found any intimations of such a connection in the literature.

In conclusion I wish to call attention to the impossibility

of submitting certain medical questions to general fixed rules; the diagnosis and therapy may often be determined only by a consideration of the particular conditions and symptoms. I recall with pleasure the answer that I heard given to one of his students by the Nestor of French ophthalmologists, Panas: "*Les mots 'jamais' et 'toujours' n'existent pas dans la médecine.*"

## ON PARALYSIS OF LATERO-VERSION.

BY DR. OTTO WERNICKE, BUENOS AIRES.

Translated from Vol. XLI., 1900, German Edition, by Dr. WARD A. HOLDEN.

**I**N the past year I had the opportunity of observing a pronounced case of bilateral paralysis of latero-version due to tubercle of the pons and to confirm my diagnosis at the autopsy. The case is reported on account of the rareness of the symptoms and the limited number of similar observations that have been confirmed by autopsy.

J. A., aged thirty, a painter, married, was admitted, June 23, 1899, to Prof. Robert Westphal's department for internal diseases in the Hospital de Clinicas.

The patient could give no information in regard to his parents and the state of their health. He himself has suffered from asthmatic attacks in recent years, which recurred frequently and always lasted several days. In January, 1892, he acquired a chancre, which was followed by swelling of the submaxillary and inguinal glands, an eruption on the skin, mucous patches in the mouth, and alopecia. He had not undergone a thorough course of treatment.

Four months ago he began to have vertigo, which made it difficult for him to walk. He also noticed paræsthesias and marked decrease in the strength of his arms and legs, occasionally accompanied with pain and diminution of vision. The patient attributed these symptoms to the over-use of alcohol and paid no great attention to them. Since, however, they increased even after he had ceased to use alcohol, and a cough with considerable expectoration developed, he presented himself at the hospital.

*St. Pr.*, June 24, 1899. An emaciated man of medium height, white. At various points of the body, scars of wounds which he had received in brawls.

Symptoms of advanced tuberculosis of the lungs, particularly



the right ; tubercle bacilli in the sputum. Heart, liver, and spleen normal. Loss of appetite, and constipation. Epigastrium sensitive to pressure. Retention of urine relieved after repeated catheterization. Amount of urine, 1 litre ; no albumen, no sugar.

The patient could stand upright only with great difficulty. If he closed the eyes, he at once staggered. His gait was that of a drunken man, on account of the marked inco-ordination of the extremities. Lying in bed he could perform any movement desired, but only with uncertainty and after repeated trials. The sensation of pain was moderately diminished on the right side of the body. The patient's statements in regard to thermic and tactile excitations were contradictory. Tendon reflexes increased on both sides.

The patient stated that his vision was poor. Tests with figures gave an acuteness of vision of  $\frac{1}{2}$  in each eye. Accommodation preserved. Eyes normal externally, no strabismus, movements of the lids normal. Movements of the eyeballs up and down extensive. Convergence possible to about 6 *cm.* Lateral movements of the eyes completely abolished. When strongly urged, the patient would seem at times to make a slight movement to the right. If one eye is covered, it is not possible for the other eye to follow a moving finger toward its nasal side, but both eyes remain in the middle line. The patient is unaware of the faulty movement of the eyes and compensates for it by turning the head. Both pupils, of normal width, react to light and in accommodation. Refractive media and fundi normal. The patient recognizes the smallest, colored test-objects. There is no gross defect in the field. The patient does not see double even when a colored glass is held before one eye. Olfactorius, trigeminus, and facialis intact. The watch is heard—right at 15 *cm.*, left at 40. Rinne positive. Taste preserved, equal on the two sides. No difficulty in speaking or in swallowing.

His psychical condition is somewhat abnormal. On the second day he desired to be discharged, as he could be more comfortable at home. He threatened to throw himself out of the window in case he was not soon discharged. After it was shown that he was quite without means and his wife declared that she was unable to provide for him, he became calm. Even when admitted he was apathetic and his attention soon relaxed. This weakness increased in the following days so that functional examinations, such as the determination of the field of vision, became very difficult.

The condition of the eyes remained constant while he was under observation, but the affection of the lungs gradually grew worse. The psychical condition became duller. July 20th, in the morning, the patient failed to respond when spoken to. Temperature, 37.8°. Anuria. Coma and death at 9 in the evening.

**AUTOPSY**, July 21st, 9 A.M. There were pleuritic adhesions, chiefly left; bilateral advanced tuberculosis of the lungs (in the left apex a cavity as large as a hen's egg); fatty degeneration of the myocardium, congestion and fatty degeneration of the liver, parenchymatous nephritis, and tuberculous ulcerations in the cæcum and ascending colon.

**Brain.**—Externally normal except for slight dilatation of the superficial veins. Cerebro-spinal fluid in the ventricles rather excessive and cloudy. On palpation, hardening of the brain was found at two spots:

(1) At the upper end of the anterior right central convolution, extending somewhat over upon the inner side of the hemisphere, was a very hard focus as large as a bean, readily felt but scarcely perceptible. Its cut surface was gray; it did not extend into the white substance, and it was not sharply limited.

(2) In the posterior half of the right occipital lobe one could feel particularly from below an irregular hard mass, into which the knife would not pass. It was a calcareous focus in the form of a four-pointed star. Two of the points were directed downward, one anteriorly and a shorter process directly upward. These processes nowhere entered the gray matter.

Besides these two foci, changes were found in the pons. When touched from below, one felt an increased resistance in the pons. Observed from above, the floor of the fourth ventricle appeared quite convex, the greatest elevation corresponding to the region of the nucleus of the 6th nerve. The median furrow had parted over this convexity, forming a shallow cleft 2 cm long and 3 mm broad, in which the underlying tumor was distinguishable by its red color. Through the floor of the fourth ventricle one felt a round tumor of the form, size, and consistency of an eyeball. The pons and medulla were at once placed in 10 % formol and on the following day divided by a frontal section at the height of the greatest convexity. The cut surface of the tumor appeared nearly round, 2.5 cm in diameter, and it lay exactly in the middle line of the pons. It was separated above from the floor of the fourth ventricle by a layer 1.5 mm thick of normal-appearing tissue,

while beneath it a layer 6-7 mm thick remained. The tumor consisted of a yellowish caseous mass separated from the surrounding nerve tissue by a reddish zone 1 mm broad. Both halves were hardened further in formol, then in alcohol, and imbedded in celloidin.

In the sections the caseous mass appeared macroscopically to be composed of concentric rings like a stone in the bladder. It was limited by a villous layer and this again by a zone of small-celled infiltration and greatly dilated vessels. In the cheesy mass no cellular elements were longer to be seen.

The study of serial sections showed that about the level of the 5th nucleus the lesion began to be perceptible through dilatation of the vessels. Near this followed the infiltration and the caseous substance. These changes appeared, first, in the middle line and about 3 mm from the floor of the fourth ventricle, but extended more rapidly downward than upward. In sections through the greatest diameter nothing could be seen of the 6th and 7th. On either side one saw the substantia gelatinosa resting on the periphery of the tumor. The descending fibres of the 7th were not visible, but in sections a little farther back were fairly distinct and partially involved in the zone of dilated vessels. Toward the base of the brain the lesion extended in the middle line to the pyramidal tract. Farther toward the medulla the cut surface of the tumor assumed a more obliquely oval form and soon came to lie equidistant from the floor of the ventricle and the lower surface of the pons, gradually growing smaller and at the level of the vagus nucleus being noticeable only through the dilatation of the vessels.

In our case we had a complete paralysis of both pairs of muscles turning the eyes laterally, with the preservation of convergence. The symmetrical position and form of the focus explains the lack of any alteration in the position of the eyes. The focus probably proceeded from the middle line and had caused simultaneous associated deviations of the eyes both to the right and to the left. Thus the eyes under the influence of equally strong but antagonistic forces kept the middle position. This explanation is supported by Bristow's<sup>1</sup> case, in which paralysis of associated

<sup>1</sup> Cited by Wolff, "Lähmung der associirten Seitenbewegungen mit Erhaltung des Convergenzvermögens," *Arch. f. Augenh.*, xxxvi., p. 257, where the literature on the subject may be found.



movement to the right existed with conjugate deviation to the left, but later paralysis of movement to the left came on, so that the eyes stood straight again.

In the several cases of paralysis of the muscles producing latero-version, with preserved convergence, a difference in the mobility of the eyes is noticed, according as the test is made with one eye or with both. Möbius has explained the difference by supposing that the turning in of the eye in unicocular tests is to be regarded as a movement of convergence. In my case the mobility of the eye was alike whether one or both eyes were open. And when one eye was covered with a ground glass it was impossible by the most energetic urging to force the patient to turn the exposed eye in, both eyes remaining fixed. Unfortunately the condition of the patient and his inattention prevented me from repeating the experiment frequently under favorable condition in order to confirm the observation of Graefe, who, in a similar case, by long-continued practice, succeeded in obtaining a unilateral movement though a slight one.

The non-involvement of the facial nerve, notwithstanding the intimate relation between their nuclei, has been observed repeatedly. A greater resistance on the part of the nervous elements of the facial nerve has been held to explain the fact, although, as Blocq and Guinon rightly say, this would not really explain it. In my case an explanation is possible. It is not to be doubted that in the last days of the patient's life a more or less complete bilateral facial paralysis might have existed and yet been overlooked in the apathetic patient. The nucleus and the fibres of the facial nerve lay in the most peripheral portion of the focus and thus may partly at least have retained their function; if involved, they were involved later than the fibres of the 6th nerve. If we may also assume that the nucleus of the 6th was not destroyed but only concealed by the infiltration and hyperæmia, still the fibres passing from it must on their way to the base of the brain have been destroyed in the tuberculous focus long before this reached the fibres of the facial nerve.



REPORTS OF THE MEETINGS OF THE OPH-  
THALMOLOGICAL SOCIETY OF THE  
UNITED KINGDOM.

BY MR. C. DEVEREUX MARSHALL.

THURSDAY, OCTOBER 16 AND DECEMBER 11, 1902.

W. ADAMS FROST, F.R.C.S., VICE-PRESIDENT, IN THE CHAIR.

MR. H. C. BALDWIN, in a paper communicated by Mr. Nettleship, recorded a case of **dislocation of the eyeball through the palpebral aperture**. The patient was a woman, who struck the left eye against a projecting gas-bracket. Within fifteen minutes Mr. Baldwin saw her, when the eye was found gouged out and was projecting between the lids. By gentle taxis he was able to reduce it readily. The vision completely recovered, and with the exception of a slightly crinkled appearance at the outer side no visible scar remained.

MR. BEAUMONT said he had seen a case of dislocated eyeball in a child, after a difficult delivery; here also the eye was restored to its normal position after twenty-four hours.

MR. NETTLESHIP recorded a case of **birth-palsy of the sixth and seventh nerves on the same side**. The mother of the patient was thirty years of age, and she had a slightly contracted pelvis. It was a brow presentation and forceps were used, and these left a scar on the head, which was situated on the temporal bone near the ear. There was another scar on the other side, but higher up. The child was born at full term, and showed no sign of asphyxia; there was no swelling of the eyelids. Within a few hours of birth it was noticed that the child squinted inwards with the right eye, the lid remained open, and the facial muscles on the same side were paralyzed.

The right eye could not be turned outwards at all, and the pupil did not react briskly. On the 5th day the condition re-

mained unaltered, and no notice was taken of a noise made near the child's head. A slight hemorrhage was then noticed in the right fundus. Just behind the right ear was a slightly elevated ridge and groove where the forceps had pressed. The condition rapidly improved, and when nine months old nothing abnormal was noticed, except slight weakness of the orbicularis. He can now hear a watch equally well on both sides. Mr. Nettleship thought that the lesion was intracranial, and that the two nerves were affected in their course most likely by hemorrhage, and from the fact that the two nerves recovered at the same time he concluded that the nerve trunks and not the nuclei were the parts which were pressed upon by the blood clot. He did not know of any other recorded case in which these two nerves were involved in a similar lesion.

Mr. FISHER thought that an intradural hemorrhage would have to be very large to affect the nerves in the way described, and he thought a more likely explanation was that the facial nerve was nipped by the forceps as it emerged from the stylo-mastoid foramen, and that the sixth nerve was affected by a hemorrhage from the inferior petrosal sinus.

Mr. NETTLESHIP described a case of **perfect recovery of vision in a case of Leber's disease**. The patient was a tutor, twenty-eight years of age, whose sight failed six months before. The vision was  $\frac{6}{80}$  and J 16 in each eye. There was a central scotoma for green, but red could be seen much better. The choroid was dark in appearance and the knee-jerks were brisk. The patient's brother came under Mr. Doyne's care recently for a similar condition, when it was found that the original patient had quite recovered his sight, and had since become ordained and had subsequently become a schoolmaster.

He mentioned another case in which two brothers were affected, and here also one is said to have recovered his sight.

Mr. ADAMS FROST mentioned the case of a man, aged twenty-three, who suffered from the disease, and he informed him that his brother had had the disease, but had partially recovered.

Messrs. ORMOND, JOHNSON, TAYLOR, and LAWFORD all mentioned cases in which improvement had taken place, but in none had recovery taken place to so great an extent as in Mr. Nettleship's case.

Dr. LEDIARD communicated a case of **dermoid cyst of the orbit**, which had dislocated the eyeball and occupied the antrum.

The patient, a man, forty-nine years of age, was admitted to the Cumberland Infirmary in July, 1902. The eyeball had been proptosed for thirty years. The eyeball had been protruding from the orbit and had been blind for five years. A soft doughy tumor was felt above the eyeball and near the outer angle of the orbit, and the eyeball rested on the outer aspect of the malar bone. On removing the globe a dermoid cyst was discovered, which filled the orbit and antrum. The cyst wall could not be removed entirely, but the floor of the antrum was opened so as to facilitate drainage. Dr. Lediard noted the absence of any similar case in the *Transactions*, but drew attention to a case published by Mr. Spencer Watson, in the report of the *Proceedings of the Fourth Ophthalmological Congress*, in 1873.

The following card specimens were shown:

- (1) MR. A. QUARRY SILCOCK. **Detachment of the retina.**
- (2) MR. C. H. WALKER. **Embolism of the inferior temporal branch of the retinal artery.**

CLINICAL EVENING, DECEMBER 11, 1902.

WILLIAM LANG, F.R.C.S., SENIOR VICE-PRESIDENT, IN THE CHAIR.

Previous to the commencement of the meeting, Mr. LANG referred in feeling terms to the loss the Society had sustained by the death of the President, Dr. David Little. Subsequently Mr. Lang was elected by the Council to fulfil the duties of the President for the remainder of the session.

Mr. STEPHEN MAYOU showed a case of **contracted pupils undilatable by a mydriatic**. Mr. SYDNEY STEPHENSON said that there was in the patient evidence of congenital syphilis with absence of knee-jerks, and he looked upon the case as one of early tabs. The pupils reacted to accommodation but not to light.

Dr. EDRIDGE-GREEN gave demonstrations of a **classification test for color-blindness**, and also a **lantern for the detection of color-blindness**. The first consisted of colored wools, silks, glass, and cards. It was quite impossible for a person to tell by contrast the different colors unless they were actually able to recognize them. The lantern test consisted of one in which colored glasses, either alone or in combination, could be used.

Mr. CHARLES BLAIR and Dr. BERNARD POTTER showed two cases of **aniridia** and one of **coloboma of the iris** in the same family.



Mr. BLAIR also showed a case of **zonular** or **ribbon-shaped opacity in the cornea**.

Mr. E. E. MADDOX demonstrated an electric eye heater which could be applied in an eye dressing, and which could, by means of a regulating transformer, be heated by the current from the main. He also showed a lamp resistance.

Mr. SYDNEY STEPHENSON exhibited several patients whose corneas had become stained by the long-continued use of **sulphate of copper for trachoma**. The opacity covered the central part of the cornea, and was accentuated towards the upper and lower margin so as to form two crescents of a rusty or greenish color. Pieces removed from the affected cornea by scraping gave some of the characteristic chemical reactions of copper.

Mr. N. C. RIDLEY showed a case of **congenital anophthalmos** and one of **embolism of the central artery of the retina** in a young girl, which followed a severe fright.

Mr. TREACHER COLLINS showed a case of **atrophy of the optic nerves** due to lightning. This was probably due to electrolytic action.

Mr. ARNOLD LAWSON showed a case of **acromegaly** in which there was **bitemporal hemianopia**. He had treated the patient with pituitary gland, and although one eye had improved a good deal, yet the other, which was at first the better of the two, had become a good deal worse. Mr. Doyne had seen no good result arise from the treatment with pituitary gland.

Mr. LAWSON also showed an unusual form of **retino-choroidal change**, the result of **hemorrhage**.

Mr. LANG thought the case extremely suggestive of sarcoma.

Mr. JESSOP showed a case of **optic neuritis with peculiar retinal changes**.

Dr. F. E. BATTEN showed a case of **cerebral degeneration with changes at the macula**.



REPORT OF THE MEETINGS OF THE OPHTHALMOLOGICAL SECTION OF THE NEW YORK ACADEMY OF MEDICINE, HELD ON MONDAY EVENINGS, DECEMBER 15, 1902, AND JANUARY 19, 1903.

By DR. HENRY H. TYSON, SECRETARY.

PRES. DR. JOHN E. WEEKS, IN THE CHAIR.

Dr. HUNTER presented a case of **chancre of the eyelid**. Patient, a boy, age sixteen years, was seen twelve days ago, with a shallow dirty-gray ulcer near punctum, lower lid, right eye. No history to account for it. He had enlarged pre-auricular glands, also enlarged cervical glands. He stated that the latter had existed a long time. Mercurial inunctions were prescribed, and the lesion is rapidly clearing up.

DR. KIPP IN THE CHAIR.

Dr. WEEKS presented a case of **restoration of the lower lid with skin flap from the arm**. The operation was performed for the relief of cicatricial ectropion. The result was very satisfactory.

Dr. WEEKS presented a case of **sympathectomy** performed two weeks ago on left side; an iridectomy had been previously performed on the left eye. Right eye had absolute glaucoma. Vision left eye  $\frac{5}{200}$  before sympathectomy operation, increased to  $\frac{12}{200}$  after operation; field of vision was somewhat enlarged; tension T + 1. He stated that the operation was somewhat difficult on account of the ganglion being the same size as the nerve-trunk and the small size of the nerve, it resembling a branch of the cervical plexus. He makes his incision about two inches in length.

Dr. GRUENING thought that the difficulty encountered was due to the small opening; with a large incision more of the individual

vessels are seen and there is less liability of confusion in recognizing the nerve when exposed to view.

DR. WEEKS IN THE CHAIR.

Dr. C. J. KIPP reported a case of **epithelioma of the ocular conjunctiva, excision, many recurrences, and final cure.**

Patient, a woman, age twenty-six years, well developed and apparently in good health, was seen for the first time January 3, 1885, after an attack of the measles. When she was eight years old there appeared a small swelling like a pimple on the white of the eye between the cornea and outer canthus. Six years ago the swelling had attained considerable size and a doctor had attacked the growth with a knife and caustics. The growth reappeared very soon, but remained small and caused no pain or discomfort during the following two years. Since then it has been growing slowly to its present size. When first seen the ocular conjunctiva between the cornea and the outer canthus was the seat of a new growth, somewhat circular in shape and of about 16 mm in its greater diameter. It was between 1 and 2 mm in height and elevated at the corneal margin. It overlapped the outer fourth of the cornea, but was not adherent to it. It was of a yellowish-red color and of a gelatinous consistency, very vascular, and slightly movable over the sclerotic, otherwise the eye was normal. Vision  $\frac{5}{4}$ . On January 7, 1885, he made a most thorough excision of the whole growth and covered the wound by suturing the conjunctiva over it. Healed without reaction. On July 27th the eye was examined and no sign of recurrence found. A few weeks later the patient noticed the reappearance of the growth at the sclero-corneal junction, but did not have eye examined again until November 29th, when the growth was found to cover the outer third of cornea to which it was adherent. Growth was again excised and galvano-cautery applied to its base. In June, 1886, eye was again examined and red raised areas were found in three different parts of the periphery of the scar. The galvano-cautery was again applied to each and the eye cleared in about two weeks. On August 26th he found two suspicious-looking places in the periphery of the conjunctival scar and again applied galvano-cautery. On Oct. 2d he found another angry-looking spot in the cicatrix, which was destroyed by the galvano-cautery. During the following three years there was no recurrence of the growth, until May, 1889, when he found a margin of the conjunctival scar again red and raised. Galvano-cautery

was again applied, and he cauterized the tissue for some distance around the inflamed portion. Since then there has been no recurrence. In November, 1902, when last examined, thirteen years after last cauterization, the eye was entirely free from signs of disease and he thought that the case may be regarded as cured. Microscopical section showed it to be an epithelioma of the conjunctiva.

Dr. MARPLE exhibited a **section of the eye with a leucosarcoma**, exhibited clinically at the last meeting.

Dr. GRUENING read a report of a case of **corneo-scleral sarcoma**. Patient, man, age fifty years, who had a small black tumor removed from the outer side of his left cornea, with two operations and two relapses, the side of the wound being cauterized with silver-nitrate stick after the second operation. Patient was examined by Dr. Gruening in February, 1902, and he presented the following appearance: near the outer margin of the cornea, and overlapping it, was a black nodular mass, 9 mm in the vertical, 4 mm in the transverse diameter, and 3 mm in height. The whole of the bulbar conjunctiva and the lower transition fold was diffusely pigmented. A number of flat, circular, reddish bodies, 2 x 4 mm in diameter, stood out from the bulbar conjunctiva in marked contrast with the black background. They were situated between the inner edge of the cornea and the semilunar fold and between the lower edge of the cornea and the transition fold. On February 12th the eyeball, with the epibulbar growth, the flat conjunctival bodies, and parts of the pigmented conjunctiva, was excised. The microscopic examination showed that the epibulbar growth consisted of spindle cells and was a melanosarcoma. The flat bodies, consisting of unpigmented spindle cells, were leucosarcomata. The black color of the conjunctiva was due to pigmentation of the otherwise normal conjunctival epithelium. The patient made a good recovery; the wounds cicatrized and he wore an artificial eye eight weeks. In May a leucosarcoma appeared in the conjunctival scar. This was excised. Four weeks later the tumor recurred in the second scar. The orbit was then exenterated; the lachrymal glands, conjunctiva, and tarsus of the upper and lower lids were removed. No recurrence up to the present time.

Dr. WEEKS stated that the extension of these growths was not always confined to the orbital tissues, as he had seen one case where it had extended to the pre-auricular glands.



## DR. GRUENING IN THE CHAIR.

Dr. WEEKS read a report of a case of **neoplasm of choroid resembling adenoma**, and exhibited a microscopic specimen of the case. He stated that the patient, a woman, age forty-seven, had consulted him for a severe pain in her head, located in the right temporal region, with also considerable pain in her right eye. Three weeks after the pain commenced she noticed that the vision had almost entirely been lost in the right eye. One week before he examined the eye the vision had been entirely abolished. He made a diagnosis of a tumor in the eye and enucleation was performed. Microscopic examination revealed a structure resembling an adenoma.

Dr. CUTLER read a paper entitled **circumscribed plastic choroiditis with a report of six cases**. He stated that these cases were especially interesting on account of the uncertainty of their etiology. In one case there was a history of probable tuberculosis at an earlier date, and at the time of the onset of the present attack the patient had lost flesh and was in poor general condition. This must, however, be regarded merely as a predisposing factor. The onset of the uveitis two weeks before the first examination was accompanied by sore throat, severe pain in the lumbar region, with frequent passage of dark urine and constipation. In the second case the history of intestinal toxæmia was very clear. In the third the patient showed no signs of general disease at first, but shortly after the development of the choroiditis there appeared a pleurisy with a septic fever and symptoms pointing to a subdiaphragmatic abscess. In the fourth case the attack, accompanied by episcleritis in the opposite eye, sore throat, and pain in the knee joint, suggested an infection resembling rheumatism. In the fifth case the disease began during typhoid fever and recurred in the edge of the same choroidal patch a year later. The sixth case gave no clue whatever to causative factors. These cases were not syphilitic. The choroiditis was circumscribed and benign. Other portions of the uveal tract were not involved, and precipitates on Descemet's membrane occurred in but two cases. The patients were between nineteen and twenty-seven years of age, except one, who was thirty-five when she came under observation, but she had had several previous attacks. Three were women, two men. The prognosis was good in these cases, as the macular regions were not involved. The disease seemed benign



and to be limited by the underlying physical conditions. This was considered the point of most importance in the treatment, and a protest was made against the tendency to treat these cases with any heroic doses of pilocarpin and the salicylates which add to the existing depression. This class, well described by Hill Griffith, seems distinct from the forms of malignant uveitis depicted by de Schweinitz and others, although there are many points in common, and much longer observation will be needed to state whether a line may be drawn or whether the milder form in its relapses passes, as a rule, into the more severe.

Dr. DUANE stated that in these cases it was difficult to locate the site of the lesion as regards the choroid or retina, and that the appearance of a red optic disc with vitreous opacities does not always mean an optic neuritis.

Dr. GRUENING stated that Dr. H. Knapp had described cases of plastic choroiditis thirty years ago, and he was not in favor of calling it Hill Griffith's choroiditis. He thought exudative choroiditis was sufficiently descriptive of the disease.

Dr. H. KNAPP described a case of choroiditis with peculiar features. The patient had lost the sight of one eye with an irido-choroiditis, and complained of flashes of light in the other eye, in which he had had a circumscribed choroidal exudation. The question arose whether he was threatened with a retinal detachment. The examination of the fundus revealed a large patch of choroidal atrophy with excavation of the sclerotic, the retina lining the wall of the excavation.

Dr. WEEKS thought that the etiology in these cases was interesting. He was of the opinion that it was due to some disorder of the blood-vessels and to micro-organisms which circulate in the blood and which were deposited in foci. He thought it was well worth research.

Dr. CUTLER stated that he did not pretend to add anything new or to present any new name for the disease. He simply presented the paper for discussion as to etiology, etc.

#### MEETING OF MONDAY EVENING, JANUARY 19, 1903.

DR. JOHN E. WEEKS, CHAIRMAN *pro tem*.

At the annual **election of officers** for the ensuing year, **Dr. A. Duane** was **elected Chairman**, and **Dr. H. H. Tyson** was **re-elected Secretary**. On account of the absence of the Chairman, **Dr. Weeks** was elected **Chairman pro tem**.

Dr. WEEKS stated that **the case** he had reported at a previous meeting as **resembling adenoma** of the **choroid**, had **died**, and **cancer** of the **lungs** was observed at the autopsy.

Dr. P. FRIEDENBERG **presented a new color test for testing central vision.** The instrument resembles an ophthalmoscope. The colored discs taking the place of lenses are seen simultaneously by patient and examiner. They are exposed to view by drawing down a shutter, which, on being released, springs back and obscures the color square. This is 4 mm square, and by moving a catch can be enlarged to 8 mm. The colors are translucent, and can be used by transmitted light. The instrument is portable, simple, and inexpensive. [Will appear in full in the May No. of these ARCHIVES.]

Dr. H. KNAPP thought the test was convenient, and an improvement on present methods.

Dr. CLAIBORNE presented a pair of **trachoma forceps** somewhat similar to the smooth roller forceps, excepting that the rollers have slightly elevated points.

Dr. OATMAN presented **trachoma instruments designed by Dr. Jameson.**

Dr. JAMESON stated that his method was one of superficial grattage.

Dr. CLAIBORNE did not favor the Jameson method on account of the number of operations required. He used Knapp's forceps.

Dr. LAMBERT had used the Jameson instrument on two cases with considerable reaction — more than usual; and also objected to it on account of the number of operations required. The Claiborne forceps he did not think possessed any advantage over the ordinary rollers. He used the Noyes forceps.

Dr. WOOTAN stated that he used the Noyes and Prince forceps, but he thought the cases on which he had seen the Jameson instrument used had resulted well.

Dr. H. KNAPP stated that the smooth forceps were not new, having, before Prince and Noyes, been used by Himley and others. In treating trachoma the principle was, not to destroy mucous membrane. Cauterizing and cutting away the follicles will cure trachoma but destroy the conjunctiva. The best method was the one that radically removed the granules with the least sacrifice of healthy tissue. This object, so far as he had experience, was best obtained by the roller. The smooth fixed forceps will remove the granulations, but at the expense of a good

deal of conjunctiva. Many roller-forceps were imperfectly made. In some the cylinders were too thin and did not rotate well, in others they were too thick and clumsy. Many failed in having too little play at their pivots. They should be carefully cleansed and sterilized (boiling) immediately after use, and dried by evaporating the water at the pivots and creases by holding the instrument against the hot chimney of an Argand burner. The technique of its use requires delicacy and perseverance; it will have to be learned.

Dr. CALLAN stated that he thought it was not so much the design of the forceps as it was the man who uses them. In operating he scarifies and uses Prince's forceps.

Dr. WEEKS stated that in trachoma, where the follicles are discrete, he believes in superficial scarification, and uses Noyes's forceps.

Dr. MARPLE stated that he believes that scarification gives better results than without it.

Dr. JAMESON stated that in the follicular trachoma two or three operations with his instruments were sufficient. In some other cases it required a number of operations. He misunderstood the inquiry when he stated that it required fifty operations to cure trachoma with his method.

Dr. LAMBERT inquired whether any one had used formalin after trachoma operations. He had heard of it being used in 1:2000 solution after such cases.

Dr. TYSON stated that he had not used it after trachoma operations, but had used it in acute epidemic conjunctivitis and ophthalmia neonatorum in 1:5000 and 1:10,000 solutions, and had obtained some excellent results. He found that solutions made by druggists in general were unreliable and the results varied accordingly. In some cases decided smarting and discomfort would follow its use at home, while the solution properly made and used in his office would not act unpleasantly. In some cases of blennorrhœa it acted rapidly and with marvellous effect, while in other cases it apparently failed to exert any influence. The solution was very unstable and lost its strength rapidly; it should be kept tightly corked.

Dr. WEEKS stated he had used it in corneal diseases—*e. g.*, keratitis denticata in 1:2000 solution, but thought it produced a congestion of the iris resembling a subacute iritis.

Dr. FRIEDENBERG presented a **color-test lamp**.



The lamp is composed of asbestos chimneys to be used over an Argand burner or electric bulb. There are three discs: disc No. 1 contains white, green, red, blue, purple, yellow, as used for signals on the N. Y. C. & H. R. R. R.; No. 2, ground glass and London smoked glass to give effect, respectively, of mist and fog; No. 3, apertures from 1 mm to 25 mm in diameters. The test-distance for 1 mm aperture and low flame is three inches. A movable shutter swings past the apertures and exposes the lights momentarily or for as long a period as is desired.

Dr. LAMBERT stated that he uses Dr. W. Thomson's lamp which is almost exactly similar to the lamp shown by Dr. Friedenbergl. He had found this test confirmed the wool test, but had not detected any defect not shown by the wool test.

Dr. SCHAPRINGER reported a case of **traumatic cataract produced by the breaking of a catgut violin string**, one end of which struck the eye. The patient had a slight superficial corneal opacity, two posterior synechiæ, and an opacity of the lens in the upper-outer quadrant. Vision was considerably reduced considering the transparency of the rest of the lens. Counts fingers at a few feet. The question was whether to extract it or to leave it alone. Vision had not changed much, if any, of late.

Dr. H. KNAPP advised leaving it alone, as he saw nothing to be gained by an operation.

DR. H. KNAPP IN THE CHAIR.

Dr. WEEKS reported a case of **panophthalmitis from infection with the micro-organism lanceolatus, without a perforating wound of the eyeball**. W. S., aged seventeen years, was admitted to the New York Eye and Ear Infirmary on November 29, 1902, complaining of pain and loss of vision. The symptoms had appeared three days previously. Vision in the right eye was nil; the ocular and palpebral conjunctivæ were slightly congested; lachrymation was profuse; the eyeball was enlarged, the cornea clear, the anterior chamber more shallow than normal, the pupil of moderate size, the iris of a yellowish tone, the lens transparent, and a yellowish reflex, which was uniform throughout the pupillary area, was present. The patient complained of pain in the side of the head corresponding with the affected eye. Hot bathing and atropine locally, and small, frequently repeated doses of calomel internally, were ordered. Temperature 99.5° F. On



December 5th the temperature reached 100° F.; there was considerable chemosis, the anterior chamber was filled with yellow exudate. As it was impossible to save the eyeball, exenteration was done on December 6th, the cavity of the emptied sclera being washed out with hot bichloride (1:2000), and packed with iodoform gauze, and a light bandage applied. Pain and temperature subsided at once. The packing was changed every forty-eight hours until the end of the tenth day, at which time granulation tissue appeared.

Bacteriological examination showed that the pus which filled the posterior chamber contained the micrococcus lanceolatus in pure culture. Inoculation of tubes of blood-serum resulted in growths of this micro-organism. Inoculation of the anterior chamber of a rabbit's eye also produced a pure culture and caused a hypopyon keratitis with marked congestion of the conjunctiva. Inoculation of tubes with the hypopyon pus produced the same micro-organisms. There was an indefinite history of a blow upon the eye, but close inspection failed to reveal the slightest abrasion, nor was there any disease of the nasal passages, naso-pharynx, no pneumonia, nor grippe. The case was evidently one of infection from within, the focus from which the micro-organisms were derived being undiscoverable; the vitality of the tissues had probably been reduced by a slight contusion. The case shows the possibility of the entrance of micro-organisms into the circulation through lesions too small to be seen.

Dr. H. KNAPP thought that there could be only two ways of explaining the presence of the micrococcus within the eye, either by auto-infection—*i. e.*, metastasis, or through some undiscovered local entrance, as brain abscesses have been found to result from insignificant, unheeded injuries of the skull.

# SYSTEMATIC REPORT ON THE PROGRESS OF OPHTHALMOLOGY IN THE FIRST QUARTER OF THE YEAR 1902.

BY DR. G. ABELSDORFF, IN BERLIN; PROF. ST. BERN-  
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R. GREEFF, PROF. C. HORSTMANN,  
AND DR. R. SCHWEIGER,  
IN BERLIN;

WITH THE ASSISTANCE OF

Dr. A. ALLING, New Haven; Prof. E. BERGER, Paris; Dr. DALÉN, Stock-  
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Dr. J. JITTA, Amsterdam; Dr. KRAHNSTÖVER, Rome; Mr.  
C. DEVEREUX MARSHALL, London; Dr. P. VON  
MITTELSTÄDT, Metz; Prof. DA GAMA  
PINTO, Lisbon; and others.

Translated by Dr. WARD A. HOLDEN.

(Continued from page 90.)

Sections XV.-XVIII. Reviewed by DR. O. BRECHT.

## XV.—CHOROID.

140. **Fuchs.** Detachment of the choroid after operation. *Graefe's Archiv*, liii., p. 375.
141. **Bietti.** On detachment of the choroid after cataract operation. *Ann. di Ottalm.*, xxx., pp. 10, 11.
142. **Berl.** A contribution to the pathology of sarcoma of the choroid. *Beiträge z. Augenheilk.*, xlix., 67.
143. **Tashiro.** On the structure and pigmentation of choroidal sarcomas. *Inaug. Dissert.*, Halle, 1902.
144. **Bull, C. S.** Metastatic choroiditis occurring in the course of pneumonia, based on the study of six cases with two autopsies. *Trans. Amer. Ophth. Soc.*, 1901, abstract published in these ARCHIVES, vol. xxx., p. 427.
145. **Kipp.** A case of sarcoma of the choroid, followed by phthisis bulbi, and twenty years later by perforation of the anterior part of the globe and rapid growth of the neoplasm. *Ibid.*, 1901.

FUCHS (140) reports new cases of detachment of the choroid after operation. All cases of extraction and iridectomy performed in a period of ten months and a half were carefully examined in this regard if they presented any suspicious signs. Cases are suspicious when the restored anterior chamber becomes shallow again, or is obliterated, or is not fully restored after operation. The statistics given contain only unquestionable cases. The first series contained extractions done with the Graefe knife. The author found in 318 extractions with iridectomy, 14 detachments = 4.4 %; in 175 without iridectomy, 9 detachments = 5.1 %; altogether, in 493 extractions, 23 detachments = 4.7 %.

In these 23 cases with detachment, the course was uncomplicated in 17, and complicated in 6, or 26 %. Possibly the detachment occurs more frequently in complicated cases than in those that heal smoothly, since the number of complicated cases does not reach  $\frac{1}{4}$  of the total number of extractions.

The second series contained detachments after iridectomy. They were found 11 times in primary glaucoma, twice in secondary glaucoma, once in chronic iritis; 14 times in all. Among the 111 operated glaucomatous eyes there were detachments in 11, or 10 %, as against 4.7 % after cataract operation. To these 37 cases are added 9 which the author reported in his first paper (*Graefe's Archiv*, li., p. 199, 1900), 11 which were cited from the literature in that paper, and 3 cases reported by Augstein (*Zeitschr. f. Augenh.*, v., p. 268). The reason for the frequency of detachment after extraction and iridectomy for glaucoma lies in the rigidity of the sclera in advanced age, or in the nature of the section with the Graefe knife, or in the increased tension in glaucoma. Most of the detachments are noticed from two to eight days after the operation. The diagnostic signs are circumscribed prominence of the fundus without detachment of the retina, and, in pronounced cases, a dark, curved line at the posterior border of the elevation. Limited detachments are easily overlooked. Their size usually remains constant and rarely increases. The detachments disappear usually slowly, but sometimes quickly. They last from one day to a month, but usually their duration is about two days. The prognosis is good. In 9 eyes from which cataracts had been successfully extracted and death supervened, permitting anatomical examination, detachment was found four times. In all four the conditions were the same: serous liquid among the separated lamellæ of the suprachoroides, rupture of



the delicate tissues of the chamber angle, and absence of detachment of the retina.

Differing from this group of detachments are three other groups. In Group 2 there is traction upon the retina and choroid from the traction of inflammatory membranes, with transuded serum beneath the choroid. In Group 3 a rupture of a choroidal vessel produces a collection of blood beneath the choroid, and in Group 4 there is an inflammatory exudation. The four groups are differentiated by the outcome. In Group 1 *restitutio ad integrum* is possible, in Group 2 the detachment persists, and in 3 and 4 a partial restoration of normal conditions is possible.

BIETTI (141) observed two cases of detachment of the choroid after cataract extraction. He calls attention to the fact that of the 25 cases reported 20 followed extraction with iridectomy, 4 followed simple iridectomy, and 1 sclerotomy. Traction in the iris may readily cause a tearing of the ciliary body, allowing a filtration of aqueous humor into the suprachoroidal space.

In his second case an iridodialysis was produced at the operation, and the author believes that a temporary injury of the ciliary body may be assumed as the cause of the detachment in the other case.

BERL'S (142) case of choroidal sarcoma which was largely necrotic was peculiar in that, besides inflammation in the uveal tract, retina, and optic nerve, there was extensive œdema of the conjunctiva and scleritis. The sclera at the site of the tumor was increased to three times its normal thickness and infiltrated with cells. The episcleral tissue was swollen and loosened. Micro-organisms were not found. The author regards the necrosis of the tumor as the cause of the inflammation.

TASHIRO (143) sums up the results of his work as follows:

1. The polymorphous cells composing melanosarcoma are of the same origin. The differences in shape depend partly upon the irregularities in the shape of the chromatophores from which the cells spring, partly upon the rapid production of cells which have not reached their full development, and partly from the hypertrophy and breaking down of the cells.

2. The unpigmented cells in a melanosarcoma are quite similar elements. In the case of these cells the proliferation is too rapid to allow the formation of pigment.

3. The pigment cells produce their pigment in a metabolic



manner by their protoplasm being gradually transformed into melanin. The hæmoglobin is here only an oxygen carrier.

4. The retinal epithelium takes no part in the structure of melanosarcoma, but it may proliferate harmlessly in cases of sarcoma of the choroid.

5. Melanosarcoma is composed of a specific variety of cells which arise from chromatophores, a sort of connective tissue, and are characterized by their irregular shape and the production of melanin. Just as carcinoma arising from goblet cells becomes carcinoma mucosum, a special variety, so melanosarcoma is a special variety. Ribbert suggests the name chromatophoroma for the true cases in order to distinguish them from sarcomas that are accidentally pigmented.

#### XVI.—VITREOUS.

146. **van Duyse.** One manner of termination of the hyaloid artery. *Bull. de la soc. belge d'opht.*, Nov. 24, 1902.

147. **Marple.** A contribution to the pathology of vascular growths into the vitreous. *Trans. Amer. Ophth. Soc.*, 1901.

148. **Koller.** Cyst of the vitreous. *Ibid.*, abstract in these ARCHIVES, vol. xxx., p. 672.

In VAN DUYSE'S (146) case, a persistent hyaloid artery broke up at the infero-temporal portion of the posterior pole of the lens, where it passed over into a number of radiating filamentous opacities.

BERGER.

MARPLE (147) presents the case of a lady of fifty, who showed an interlacing system of blood-vessels coming forward into the vitreous from the upper, lower, and nasal borders of the disc. There was no other complication in the fundus. When observed again two months later, a grayish mass covered with blood-vessels was seen in the vitreous by oblique illumination, appearing exactly like a detached retina. In view of the possibility of malignant development, the eye was enucleated. The macroscopic examination showed a non-vascular mass of connective tissue attached to the papilla in the posterior part with a vascular membrane in front, the latter separating anteriorly about 4 mm back of the lens and radiating toward the ora serrata, where it joined the retina. Under the microscope the optic-nerve fibres were seen to proceed directly forward from the papilla into the vitreous with numerous small blood-vessels among them. Interest centres in the fact that of 14 cases of formation of vascular new

growths in the vitreous only the present case and one other were first observed at a time when there were no apparent retinitis or hemorrhages present. The author believes the origin to have been a hemorrhage under the membrana limitans interna bursting through into the vitreous over the papilla, with subsequent vascularization of the coagulum. The case is a typical retinitis proliferans.

ALLING.

# XVII.—GLAUCOMA.

149. **Panas.** Pathogenesis and treatment of glaucoma. *Arch. d'opht.*, xxii., 2, p. 69.

150. **Altland.** Extirpation of the superior cervical ganglion in glaucoma. *Klin. Monatsbl. f. Augenheilk.*, xl., p. 140.

151. **Fabris.** Bilateral cervical sympathectomy for glaucoma. *Gaz. d. osped. e. d. clin.*, 1901, No. 36.

152. **de Schweinitz.** Concerning the treatment of the apparently unaffected, or at least but slightly involved, eye in cases of monolateral glaucoma. *Trans. Amer. Ophth. Soc.*, 1901.

According to PANAS (149), apart from iridectomy in acute glaucoma, the only essential of all the operations for the different forms of glaucoma is the relaxation of the sclera by means of a section as near as possible to the angle of the iris and Schlemm's canal. Panas made a sclerotomy behind the plane of the iris in two cases of acute hemorrhagic glaucoma, and in eight cases of absolute chronic glaucoma, with good result in the two acute cases and in one of the others. In the successful cases there seemed to be a great collection of liquid in the posterior chamber (œdema of the vitreous or suprachoroidal space).

When iridectomy has no effect, Panas does not repeat the operation but cuts through the scar. Iridosclerotomy, which combines sclerotomy with a peripheric iridectomy, is useful in cases of leucoma adherens, with or without staphyloma, and in glaucoma with obliteration of the anterior chamber, if a considerable amount of liquid is evacuated.

In simple chronic glaucoma with slight periodic blurring of vision, with or without cloudiness of the cornea and dilatation of the pupil, a broad iridectomy is indicated. Enucleation should be replaced by keratectomy—removal of the cornea, iris, and lens, with the introduction of a suture. This always gives good results.

In conclusion, Panas recommends again oily solutions of eserine, which can be preserved longer, are better borne, and have a more

intense action than the aqueous solutions. Once he cured with an oily solution an acute glaucoma, and in cases of simple inflammatory and infantile glaucoma he obtains a cure or a considerable improvement.

V. MITTELSTÄDT.

ALTLAND (150) reports a case of glaucoma simplex which has remained free from attack for seven months after extirpation of the ganglion, while previously there were exacerbations every second day.

DE SCHWEINITZ'S (152) conclusions are as follows: 1. In cases of acute glaucoma, the apparently unaffected eye should be operated upon as soon as the wound in the opposite eye is closed, provided any indications of involvement are present; in absence of signs, a preventive iridectomy is justifiable. 2. In chronic congestive glaucoma, the same advice applies. 3. In chronic simple glaucoma, if any periods of increased tension, however temporary, can be demonstrated, operation (the author favors iridectomy) should be performed even if the central and peripheral vision are intact.

ALLING.

#### XVIII.—SYMPATHETIC OPHTHALMIA.

153. **Terrien.** The sympathetic affections of the eye. *Gaz. des hôpitaux*, 1901, No. 144.

Sections XIX.—XXII. Reviewed by PROF. GREEFF, Berlin.

#### XIX.—RETINA AND FUNCTIONAL DISTURBANCES.

154. **Hoffmann.** A contribution to the knowledge of vascular changes in the eye in chronic nephritis, from the microscopic examination of the eyes of a patient with the typical picture of embolism of the central artery. *Arch. f. Augenheilk.*, xliv., p. 339.

155. **Druault.** Researches on quinine amaurosis. *Arch. d'opht.*, xxii., 2, p. 93.

156. **Vries.** Endarteritis of the central artery of the retina. *Med. Tydschr. v. Geneesk.*, 1902, I, No. 7.

157. **van Duyse.** Simultaneous embolism of the central artery in the two eyes. *Bull. d. l. soc. belge d'opht.*, Nov. 24, 1901.

158. **Rosenberg.** On the pathogenesis of toxic neuroretinitis. *Wjest. Ophth.*, Jan.—Feb., 1902.

159. **Tichomiroff.** A case in which a subretinal extravasation was quickly absorbed under the influence of blue rays. *Ibid.*

160. **Leplat.** Arterio-venous aneurysm of the retina. *Bull. d. l. soc. belge d'opht.*, Nov. 24, 1901.

161. **Chevallereux.** Traumatic rupture of the retina. *Bull. d. l. soc. d'opht. de Paris*, Feb. 4, 1902.



162. **Jones, E. Harris.** The relation of glaucoma to thrombosis of the retinal veins. *Brit. Med. Jour.*, Jan. 18, 1902.
163. **Hahn and Knaggs.** Detachment of retina during labor. *Lancet*, May 18, 1901.
164. **Snell, Simeon.** Sun-blindness of the retina. *Brit. Med. Jour.*, Jan. 18, 1902.
165. **Würdemann.** Blindness from inhalation and ingestion of methyl alcohol. *Amer. Med.*, Dec. 21, 1901.
166. **de Schweinitz and Shumway.** Histological description of an eyeball with dropsical degeneration of the rod and cone visual cells of the retina, which clinically simulated glioma. *Trans. Amer. Ophth. Soc.*, 1901.
167. **Heath, F. C.** Amblyopia from carbon bisulphide poisoning. *Annals of Ophth.*, Jan., 1902.
168. **Murakami.** A contribution to the pathological anatomy of chorioretinitis disseminata, with remarks on inflammatory formation of rosettes of the neuro-epithelial layer, spontaneous formation of perforation in the macula, etc.

HOFFMANN (154) describes a case showing that albuminuric retinitis caused by arterio-sclerosis of the central artery may exactly resemble in its clinical aspects embolism of the artery. Most of the recent writers consider the other symptoms of albuminuric retinitis secondary to the vascular changes. Hoffmann's case is a fine example to support Michel's view that retinitis albuminurica is only the expression of circulatory disturbances and tissue lesions caused by a primary disease of the vessel walls in the form of an arterio- or thrombo-phlebitis of the central vessels.

DRUAULT (155), after experimenting on dogs, comes to the conclusion that the degeneration of the multipolar ganglion cells of the retina in quinine amaurosis is due to the immediate effect of the quinine upon these cells and not to disturbance of circulation. The latter, which manifests itself in pallor of the disc and constriction of the vessels six to seven hours after the subcutaneous injection of an almost lethal dose of quinine, is mostly so slight that it can hardly be the cause of the cellular degeneration that begins at that time. Furthermore, it passes off in twenty-four hours to return in four or five days and increase up to the twentieth or thirtieth day. This secondary anæmia is not the cause but the result of the already existing destruction of the ganglion cells of the retina. Only the cells in the middle of the retina, differing in structure from the others, remain unchanged, which is not in accord with the idea that the anæmia is the actual cause of the degeneration.

In quite young dogs whose ganglion cells are not fully developed, and when the cells have undergone changes following



section of the nerve, the quinine changes do not occur, as the author showed in a paper in the *Arch. d'opht.*, 1900.

V. MITTELSTÄDT.

In the case reported by VAN DUYSE (157) a man of seventy-one in good health, except for atheroma of the heart and vessels, suddenly became blind in the left eye and a few minutes later in the right, with the typical picture of embolism of the central artery in both eyes. Later there was poor circulation in the veins.

The writer excluded every other cause of blindness except embolism. In other similar cases vision has returned in one eye, but in this case both eyes remained blind. V. MITTELSTÄDT.

ROSENBERG (158) injected the toxin of typhoid fever into the subarachnoid space in rabbits and found that a basilar inflammation was set up with œdema of the retina, interstitial and parenchymatous disturbances in the nerve, and even sometimes a well-marked choked disc. The pupil remained large and sluggishly responsive to light for a month or two, and there was frequently nystagmus and sometimes transient exophthalmus.

JONES (162) publishes four cases in which glaucoma followed unilateral thrombosis of the retinal vein associated with arteriosclerosis but without albuminuric retinitis.

The oldest patient was sixty-six years, and the age of the other three was fifty-nine. In three of them acute glaucoma came on six weeks after the thrombosis, and in one chronic glaucoma did not come on for nine months. In two of the cases both eyes were affected with glaucoma, although only one had thrombosis of its retinal vein.

In some there were hemorrhages on the surface as well as into the substance of the iris, showing that the ciliary arteries were also affected. This is a strong contra-indication to the performance of iridectomy. The prognosis in simple thrombosis is not so bad unless acute glaucoma supervenes, and if it does, this is most serious, since iridectomy does not afford much chance of success.

MARSHALL.

HAHN and KNAGGS's (163) patient, aged twenty-one, when first seen had been in labor for twenty-four hours. For three weeks the face, legs, and hands had been œdematous. She was now semi-conscious and quite blind, this having suddenly developed. Labor was terminated, but for thirty hours there was no excretion

of urine. The ophthalmoscope showed that the lower third of each retina was detached.

Her general condition began to improve, and in less than a month afterwards no detachment was visible. Shortly after, the vision had gone up, and there was only a slight loss of the upper part of the fields.

The authors attribute it to the general anasarca, and consider that temporary detachment of the retina is more frequent than is apt to be supposed. MARSHALL.

SNELL'S (164) patient, whose case is here reported, was a man aged forty, who at intervals was looking at the sun in eclipse on May 29, 1900, for about an hour; part of the time he used a blue glass and part of the time a ruby glass and occasionally he used nothing at all.

An hour or two later direct vision was blurred, and the same evening he found it impossible to read a newspaper on account of a hazy blankness of a circular shape with an indistinct outline. At first it appeared to be about the size of a penny but it soon got smaller. The direct vision was found to be  $\frac{6}{24}$ , and indirect vision  $\frac{6}{8}$ . There was slight haziness around the papilla and the veins were very full. The central blur became fainter and on June 8 the direct vision of both eyes was  $\frac{6}{8}$ . On July 5 it was  $\frac{6}{8}$ .

A small disc was seen on everything that was looked at, but this became smaller and smaller and finally disappeared. The patient is now quite well and there are no ophthalmoscopic changes visible.

The interest of the case lies in the fact that both eyes were affected and both recovered, leaving no ophthalmoscopic change behind. MARSHALL.

DE SCHWEINITZ and SHUMWAY (166) report a case which showed a series of cyst-like spaces, situated in the external nuclear layer which was itself absent. The cavities were bounded laterally by the thickened fibres of Müller and externally by the external limiting membrane. They were crossed by a fine reticulum of large flat cells. After excluding other explanations, the authors conclude that the condition is a dropsical degeneration of the nuclei and surrounding protoplasm of the visual cells.

ALLING.

HEATH (167) observed the case of a girl who worked two months in a rubber factory and had shown symptoms of irritability, mental impairment, muscular weakness, and dimness of vision. After one

year the vision was  $\frac{1}{8}$ . The ophthalmoscope showed only pallor of the optic discs. There was no central scotoma, but the field of vision was contracted, especially for colors. The amblyopia was accredited to the use of carbon bisulphide during the time she worked at the rubber.

ALLING.

MURAKAMI (168) made a microscopic examination of a case of hole in the retina at the macula after syphilitic chorio-retinitis. In the macular region he found œdema in the form of a system of cavities in the inner nuclear and outer reticular layers. At the periphery of the altered area the inner nuclear layer was split into two layers, forming a cyst. The deeper layers of the retina had almost entirely disappeared.

About the centre of this area, corresponding to the macula, the anterior wall of the cyst was wanting for  $\frac{3}{4}$  mm. There was here a hole in the retina with undermined margins communicating directly with the vitreous chamber.

## XX.—OPTIC NERVE.

169. **Siegrist.** On little known forms of disease of the optic nerves. *Arch. f. Augenheilk.*, xliv. Ergänzungsheft.

170. **v. Michel.** On bacterial emboli in the optic nerve. *Zeitschr. f. Augenheilk.*, vii., 1.

171. **Rosenbaum.** A contribution to aplasia of the optic nerve. *Ibid.*, 3.

172. **Sulzer.** Compression and atrophy of the optic nerves in a case of generalized molluscum (von Recklinghausen's disease). *Bull. d. l. soc. d'opht. de Paris*, Jan. 7, 1902.

v. MICHEL'S (170) patient, a man of forty-five, had pyæmia after an injury to the nose. Clinically a diagnosis of metastatic iridocyclitis was made.

At the autopsy there were found endocarditis and multiple embolic foci of softening in the brain. The microscopic examination revealed unexpected metastatic foci in the posterior portion of the optic nerve. Streptococcus emboli were found not only in the vessels of the major vascular circle of the iris, whence the inflammation in the anterior segment of the ball, but also in the central artery of the retina. There were three foci in the optic nerve, the largest in the dural sheath, the two smaller in the nerve trunk.

ROSENBAUM (171) collected the cases of aplasia of the nerve in the literature and added new ones. In rare cases, in congenital malformations, particularly anencephaly and hydrocephaly, the optic nerve may be entirely wanting. In anencephaly the cells of the ganglion-cell layer of the retina are usually wanting, as are also



the nerve fibres of the retina and nerve (Manz, Carafi, Ritter, Hegler, v. Leonowa, Rosenbaum).

Seiler described the microscopic condition of the eyes in hydrocephaly. The optic nerve and retina were wanting, but the eyes were otherwise well formed. Rosenbaum describes two similar cases. In both the optic nerve seemed to be present, but microscopically it was found to consist of tough connective tissue with no nerve fibres. Only vessels and a small amount of glia tissue passed from the papilla to the retina. The lack of nervous elements in the anencephalic is attributed to a systemic defect, *i. e.*, in the germ plasm the proton of the neuron is absent (Petrén, Rosenbaum).

Dötsch described a case of microphthalmus in man in which the optic nerve was represented by a thin tract of connective tissue. There were no nerve fibres in it or in the retina.

Van Duyse examined a cyclopic eye in which no nerve was present.

Rosenbaum found a lack of optic nerve and disc in a grown rabbit. He believes the lack of development of the nerve is of retinal origin. Possibly this defect depends upon the absence of the retinal vascular system which nourishes the ganglion cells and nerve fibres.

Aplasia of the nerve may arise from developmental anomalies that are cerebral, as well as from such as exist in the eye alone or in the surrounding parts.

#### XXI.—INJURIES, FOREIGN BODIES, PARASITES.

173. **Staever.** Subconjunctival perforation of the sclera from an arrow injury. *Zeitschr. f. Augenheilk.*, vii., 3.

174. **Panas.** Injuries of the eyeball and orbit from firearms. *Arch. d' opht.*, xxii., 3, p. 133.

175. **Volkmann.** The theory of eye magnets. *Klin. Monatsbl. f. Augenheilk.*, Jan., 1902.

176. **Cramer.** A further contribution to the clinical aspects of iron splinters in the eye. *Zeitschr. f. Augenheilk.*, vii., 2.

177. **Nuel.** Paralysis of the external oculomotor nerve as the sole symptom of a traumatic rupture of the internal carotid in the cavernous sinus. *Bull. d. l. soc. belge d'opht.*, Nov. 24, 1901.

178. **Bocchi.** Extraction of a subretinal cysticercus. *Ann. di Ottalm.*, xxx., 8-9.

179. **St. John.** Large foreign body in the anterior chamber removed with preservation of perfect vision, with photograph of foreign body in situ. *Trans. Amer. Ophth. Soc.*, 1901.

180. **Hubbell.** A case of foreign body lodged within the eyeball and



removed eighteen years after the injury. Sympathetic inflammation three times without loss of vision. *Ibid.*

181. **Sweet.** Result of X-ray diagnosis and of operation in injuries from foreign bodies. *Ibid.*

182. **Fox, L. Webster.** A new localizer for determining the position of foreign bodies in the eye by the Roentgen rays. *Phil. Med. Journ.*, Feb. 1, 1902.

PANAS (174) describes shot injuries of the eye and orbit as seen by him and as reported in the literature. In the first portion of the paper he discusses injuries with small shot. In these cases conservative treatment is indicated. Even when the foreign body is in the eye enucleation need not always be done, because the foreign body will often be borne without sympathetic ophthalmia arising. Furthermore, it is often difficult to say whether the shot is in the eyeball or in the orbit. He recommends that the eyeball be moved while exposed to the X-rays in order to determine whether the shadow of the foreign body moves or remains fixed.

In the second portion of the paper he treats of revolver shots of the orbit which usually are produced by would-be suicides. The prognosis in these cases is grave. The ophthalmoscopic picture differs according as the ball has struck the optic nerve before or behind the entrance of the vessels. Anosmia is rare, but it is found in injuries at the level of the lamina cribrosa. Revolver bullets in the orbit may cause phlegmon or sympathetic inflammation years after the injury. In a case of phlegmon Panas found in the enucleated eye the bullet from a *chassepot* which had been in the eye fifteen years. It is advisable when it can readily be done to remove bullets early.

In the third portion of his paper, Panas reports three cases of shot wounds in the mouth, in the orbit, and in the ear. In the first case there was paralysis of the fifth and seventh nerves with lagophthalmus and neuroparalytic keratitis, and in the third case with marked lagophthalmus the cornea was intact. Panas believes that the corneal affection is not due to the lack of function of the Gasserian ganglion, but to a state of excitation of the fifth nerve.

In the treatment of these injuries the main point is to prevent primary or secondary infection. V. MITTELSTADT.

CRAMER (176) removed an iron splinter from a patient's eye. It was supposed that another splinter remained in the eye. After a time there was acute lessening of tension, and months later typi-

cal glaucomatous attacks. The lens was removed and later an iridectomy done, after which the eye became quiet. The iris assumed a rust color, and the diminished vision suggested a beginning degeneration of the retina from the presence of iron in the eye.

Two cases: 1. Perforating wound of the cornea, traumatic cataract, iron splinter in the posterior chamber, iridectomy, extraction of the splinter. Extraction of cataract, sympathetic inflammation of the second eye, enucleation of the first, cure of the sympathetic ophthalmia. 2. Perforating wound of the cornea, traumatic cataract, iron splinter in the lens. Removal of the splinter and extraction of the cataract with good result.

The magnet which was at hand was not used in either case.

In NUEL'S (177) case the patient was struck at the inner canthus with the point of an umbrella. At first he was unconscious, then followed vertigo, severe headache, swelling of the lids, and a slight convergent strabismus. Three weeks after the injury there was only a paralysis of the external rectus. Nuel assumed an intra-orbital or intracranial lesion of the sixth nerve. Three months later the patient died after an apoplectic attack. At the autopsy it was found that the internal carotid had been torn within the cavernous sinus and the only result of this injury was an atrophy of the sixth nerve. The sudden death was due to hemorrhage into the ventricles.

BERGER.

BOCCHI (178) after incising the sclera and choroid removed a cysticercus with preservation of the ball. The sclera and conjunctiva were closed with the same sutures, the knots lying upon the conjunctiva.

KRAHNSTÖVER.

SWEET (181) presents a table of sixty-five cases in which the X-ray showed a foreign body in or near the eyeball. So far as the findings in these cases could be verified by extraction of the foreign body or after enucleation, the substance was in every instance situated at the spot indicated by the radiograph.

ALLING.

FOX (182) has devised an instrument in the form of an oval band of gold or silver so shaped as to conform to the outline of the eye, and provided with two strands crossing in front at right angles, thus dividing the instrument into quadrants. This skeleton hemisphere is fitted over the anterior portion of the eyeball under cocaine and serves the purpose of localizing a foreign body. A number of skiagraphs accompany the article.

ALLING.

## XXII.—OCULAR DISTURBANCES IN GENERAL DISEASES.

183. **Sidler-Huguenin.** On hereditary syphilitic changes in the fundus, with general remarks on eye affections in hereditary syphilis. *Habilitations-schrift*, Hamburg and Leipsic, J. Voss, 1902.

184. **Senn, A.** Retino-chorioiditis rudimentaris e lue congenita. *Arch. f. Augenheilk.*, xliv., Ergänzungsheft.

185. **Greeff.** On the "tubular visual field," in hysteria. *Berl. klin. Wochenschr.*, 1902, No. 21.

186. **Jocqs.** On ophthalmoplegia in syphilis. *Bull. d. l. soc. d'opht. de Paris*, Dec. 3, 1901.

187. **Nathanzon.** Ophthalmia metastatica septico-pyæmica. St. Petersburg, 1902, pp. 32.

188. **Stocker.** An unusual case of thrombosis of the anterior basal sinuses following orbital thrombophlebitis. *Arch. f. Augenheilk.*, xliv., Ergänzungsheft.

189. **Hertel.** On three cases of severe bilateral pneumococcus infection of the eyes after measles. *Graefe's Archiv*, liii., p. 503.

190. **Nikolsky.** A case of panophthalmitis of malarial origin. *Wjest. ophth.*, 1902, Jan.-Feb.

191. **Cerano.** Ocular affections in their relation to diseases of the nasal cavities and the sinuses of the face and brain. 2 vols., Naples, *Unione Tipographica*.

192. **Chaillons.** Ocular lesions in the course of polymorphous erythema. *Ann. d'ocul.*, cxxvii., p. 173.

193. **Strzeminski.** Rare ocular complications of the mumps. *Rec. d'opht.*, xxiv., 2, p. 65.

194. **Vaquez.** Pupillary disturbances and lesions of the aorta. *Bull. d. l. soc. mèd. d. hôpitaux*, Feb. 7, 1902.

195. **Leprince.** Meningitic ocular affections. *Ann. d'ocul.*, cxxvii., p. 207.

196. **Chevallereau and Chaillons.** Conjugal tabes. *Bull. d. l. soc. d'opht. de Paris*, Feb. 4, 1902.

197. **Jackson.** Ocular lesions of small-pox. *Denver Med. Times*, Dec., 1901.

198. **Stricker.** Diseases of the eye due to abnormal conditions of the circulatory system. *Cincinnati Lancet-Clinic*, Dec. 21, 1901.

SIDLER-HUGUENIN (183) has looked over 120,000 case histories of Professor Haab and his own for the purpose of studying the various forms of retinitis in hereditary syphilis. The fundus changes are manifold, but one may agree with the writer, who divides them into four main types:

1. Small yellowish-red spots scattered over the fundus with punctate pigmentation (Haab's *Atlas*, 1st edition, Fig. 31, Antonelli, and others).

2. Larger spots, the dark predominating (Haab's *Atlas*, Fig. 32).



3. Large spots, the light predominating (initial stage).

4. A condition similar to retinitis pigmentosa. Besides these there are mixed forms and atypical cases.

SENN (184) states that if cases of "amblyopia without pathological changes" are carefully examined with the pupils dilated, one often finds slight changes indicating existing or past chorio-retinitis due to hereditary syphilis. Senn's descriptions agree with Antonelli's, designated as "stigmata ophtalmoscopiques rudimentaires de la syphilis héréditaire," although in some details the authors differ.

GREEFF (185) presented a hysterical girl of twelve, with no objective changes in the eyes. Examination indicated that the fields were very greatly contracted, yet the manner in which the girl went about proved that they were not. The size of the field remained the same at every distance within 6 *m*, not corresponding to a fixed angle and dilating with the distance. Such a condition has aptly been termed a tubular-shaped field, differing from the funnel-shaped field which grows larger with increasing distance from the eye. Greeff finds the tubular-shaped field a very frequent and characteristic symptom in hysteria.

STOCKER (188) describes first the symptoms and manner of development of thrombosis of the anterior basal brain sinuses, and then presents an interesting clinical history. His patient struck the left eye against the wing of an open French window. There developed phlegmon of the retrobulbar tissues with marked exophthalmus. An opening was made down to the bone and the cavity drained. Two days later the other eye protruded and its mobility became diminished. Fever and apathy. It seemed that the process in the left orbit had produced a phlebitis which had been carried through the basal sinuses to the veins of the other orbit. Diagnosis: Infectious thrombosis of the brain sinuses. The patient recovered, and in this respect the case differed from all others reported in literature.<sup>1</sup>

NIKOLSKY (190) describes in detail two cases he observed of purulent metastasis in the eye and one case of metastatic inflam-

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<sup>1</sup> Cases of the kind are reported where traumatic phlebitis produces non-infective thrombosis of the cavernous sinus, and spreads through the circular sinus to the cavernous sinus and the orbital veins of the other side. They are grave, but not necessarily fatal. They are operable. See "Traumatic Orbital Sarcoma with Thrombosis of the Cavernous Sinus," ARCH. OF OPHTH., xxix., p. 463. —H. K.



mation of Tenon's capsule, and gives a tabulated synopsis of the literature and a continuation and completion of that presented in Axenfeld's article (*Graefe's Archiv*, xl, 1).

1. Rupture of varicose veins in the legs of a pregnant woman, thrombophlebitis, septicopyemia, abortion, metastatic ophthalmia, abscess of the kidney, infarcts in the kidney and spleen—death.

2. Osteomyelitis of the left femur and humerus, septicopyemia, phlegmon of the right shoulder, gangrene of the right lung, bronchopneumonia of the left lung, metastatic ophthalmia of the right eye—death.

3. Metastatic inflammation of Tenon's capsule following a furuncle on the back—recovery. HIRSCHMANN.

The first volume of CERANO's (191) book treats in nine chapters of the anatomical, physiological, and pathological relations between the eye and the nose and pharynx. The reciprocal relations of the eye and nose are discussed particularly.

The second volume treats of the sinuses of the face and base of the skull in their relation to the eye and brain.

KRAHNSTÖVER.

CHAILLONS (192) describes the ocular affections accompanying erythema multiforme. Besides the nodules and papules of the conjunctiva described by Terson and Beaudonnet, he discussed the appearance of solitary vesicles of the bulbar conjunctiva which come on simultaneously with vesicles on other mucous membranes. BERGER.

STRZEMINSKI (193) describes two cases of unusual ocular affections accompanying mumps. In one case there was an abscess in the tarsal conjunctiva, in the stage of incubation; in the second case, three weeks after the beginning of the disease, there developed retrobulbar neuritis in the left eye with central scotoma and, months later, slight pallor of the disc and  $V = \frac{8}{10}$ . The treatment consisted in subcutaneous injections of pilocarpine and, later, salicylate of soda, iodide of soda, and strychnine. BERGER.

VAQUEZ (194) believes that the existence of the Argyll-Robertson pupil with preserved tendon reflexes in cases of aortic insufficiency proves that the latter is of syphilitic nature. He suggests that this complexus of symptoms first described by Babinski be called "syndrome de Babinski." BERGER.

A man with syphilis observed by CHEVALLEREAU and CHAILLONS (196) infected his wife. Years later both showed the initial

symptoms of tabes, the man having pupillary symptoms and the woman marked ataxia. In a second married couple there was post-syphilitic tabes, but the symptoms in the woman (ophthalmoplegia interna, mild chorio-retinitis) were not sufficient to justify the diagnosis, which was made however when the man was found to have unequal pupils and diminished tendon reflexes.

In the discussion Terson called attention to the diagnostic importance of changes in the form of the pupil with reflex iridoplegia which are characteristic of tabes. The pupil is irregularly distorted or oval with its long diameter often oblique. (This pupillary change is known in France as Berger's symptom.)

BERGER.

## SYSTEMATIC REPORT ON THE PROGRESS OF OPHTHALMOLOGY DURING THE SECOND AND THIRD QUARTERS OF THE YEAR 1902.

Sections I.-III. Reviewed by PROFESSOR HORSTMANN,  
Berlin.

### I.--GENERAL OPHTHALMOLOGICAL LITERATURE.

199. **Fuchs.** *Text-book of Ophthalmology.* Ninth edition, Leipsic and Vienna, 1903, F. Deuticke.
200. **Schwarz.** *Encyclopedia of Ophthalmology.* Leipsic, 1902, Vogel. Parts I. and II.
201. **Bernheimer.** Etiology and pathological anatomy of paralyses of the ocular muscles. *Graefse-Saemisch*, 2d edition, Leipsic, 1902, Engelmann.
202. **Widmark.** *Reports from the Eye Clinic of the Medico-Chirurgical Institute at Stockholm.* Vol. iv., Jena, 1902, G. Fischer.
203. **Hegg.** *Stereoscopic Pictures for Patients with Strabismus.* Second improved edition, Berne, 1901, Schmid and Franke.
204. **Elschnig.** Ophthalmology in Neisser's *Stereoscopic Medical Atlas.* Leipsic, 1902, J. A. Barth.
205. **Heine.** Contributions to the comparative and embryological topography of the brain in Neisser's *Stereoscopic Medical Atlas.* *Ibid.*
206. **Müller.** Contributions to operative ophthalmology. *Klin. Monatsbl. f. Augenheilk.*, xl., 1, pp. 358 and 505.
207. **Schmidt.** On the frequency of infectious external eye diseases in the industrial region of Westphalia. *Arch. f. Augenheilk.*, xlv., p. 79.
208. **Van Fleet.** The laws of the State of New York relating to contagious diseases of the eye and the results of their enactment and the desirability of further legislation. *Pediatrics*, Aug. 1, 1902.
209. **Hubbell.** Jaques Daviel and the beginnings of the modern operation of cataract extraction. *Journ. Amer. Med. Assoc.*, July 26, 1902.

210. **Friedenwald.** The history of the invention and of the development of the ophthalmoscope. *Ibid.*, March 2, 1902.

211. **Wood.** Hermann von Helmholtz, the inventor of the ophthalmoscope. *Ibid.*

212. **Cohn.** The eyes of the medical students at Breslau. *Arch.f. Augenheilk.*, xlv., p. 29.

213. **Katz.** The influence of artificial lighting on comfort and the ability to work. *Wratsch*, 1902, No. 37.

214. **Cohn.** The determination of the amount of daylight in the lecture rooms of the Breslau University. *Wochenschr. f. Hyg. u. Ther. d. Auges.* No. 40, 1902.

215. **Issupoff.** Report on the eye department of the Cossack hospital for 1901. *Wjest. ophth.*, No. 3, 1902.

216. **Loktjeff.** A brief report of the eye operations performed in the year 1901. *Ibid.*

FUCHS'S (199) excellent text-book appears in a new improved edition, the ninth since 1889. It presents many changes necessitated by the advances in science. The subject of the toxic amblyopias particularly is treated in an entirely new way. Many other chapters are enlarged and improved.

SCHWARZ'S (200) *Encyclopedia of Ophthalmology* is intended to be a reference book arranged in lexicon form. The general practitioner will find here all that he wishes and the ophthalmologist will find the views held at present in regard to the various points in ophthalmology. The parts already published contain articles from "A" to "Bacteriology of the Eye."

BERNHEIMER'S (201) treatise on the etiology and pathological anatomy of the paralyses of the ocular muscles is the best and most complete yet written upon this subject and is of interest both to ophthalmologists and neuropathologists.

The reports from the Stockholm eye clinic under the direction of WIDMARK (202) contain the following papers: A case of intracapsular absorption of senile cataract by C. Lendahl; clinical and bacteriological observations on the influenza conjunctivitis of nurslings by J. Jundell; on operations for symblepharon by May's method by J. Landström; two cases of concrement in the superior lachrymal canaliculus by A. Dalén; the etiology of myopia by J. Widmark; the siderophon, an apparatus for determining the presence of particles of iron in the body and particularly in the eye by M. Jaunson; a case of blepharochalasis by A. Dalén; and on the importance of venereal diseases as a cause of blindness by J. Widmark.



The ninth part of the *Stereoscopic Medical Atlas*, prepared by ELSCHNIG (204) contains twelve plates of excellent photographs of the external diseases of the eye, which are of great value for teaching purposes.

HEINE'S (205) ten plates represent the location of the brain within the skull in a way true to nature. Heads of the fœtus at different ages, of children, adults, and various animals, are represented. The pictures consist of successive stereoscopic photographs of one half of the head and of the corresponding half of the brain on a single plate. In the stereoscopic picture the external portion of the head appears as if made of glass and the brain is seen beneath it.

According to SCHMIDT (207), among 6000 eye patients there were 1560 cases of primary conjunctivitis. In about half of these, 784, it was of the usual non-infectious form; 248 patients had trachoma; and the 528 others had various forms of infectious conjunctivitis. In only 295 were found micro-organisms which cause infectious inflammation: the Morax-Axenfeld diplobacillus, the pneumococcus, the gonococcus, the diphtheria bacillus, and the Koch-Weeks bacillus.

Thirty-six years ago COHN (212) published the results of the examination of the eyes of Breslau students. Among 410 students he found 244 myopes, or 60%. In 1880 59% of 108 medical students were myopic. In his latest investigation he found myopia in 60%.

KATZ (213) examined many persons who worked comfortably by daylight but in artificial light at once became sleepy. The sleepiness came on soonest when the room was dark and the lamp illuminated the work-table only. When the room was illuminated with lights on the wall, work could be continued longer and the ability to work increased with the general illumination. The author believes that the depressing effect of the artificial illumination depends rather upon its insufficiency in comparison with daylight than in the lack of particular rays found only in sunlight.

HIRSCHMANN.

COHN (214) tested with the Wingen photometer the daylight illumination of the lecture rooms of the Breslau University. He believes that a room is well lighted when the illumination is more than 50 metre candles, moderately lighted when it is between 50 and 10, and poorly lighted when it is less than 10. Most of the



auditoriums were only moderately well lighted, some were poorly lighted, and but few were well lighted.

ISSUPOFF (215) treated 599 hospital and 7419 out-patients, 14.5 % being trachoma patients. He performed 662 operations, 196 being cataract extractions, with 3.5 % of loss. HIRSCHMANN.

## II.—GENERAL PATHOLOGY, DIAGNOSIS, AND THERAPEUTICS.

217. **Axenfeld.** The prophylaxis of septic infection of the eyes. *Muench. med. Wochenschr.*, 1902, p. 1067.

218. **Hirota.** Bacteriological investigations on panophthalmitis. *Zeitschr. f. Augenheilk.*, vii., p. 457.

219. **Galezowski.** Ocular syphilis. *Bull. de la soc. de dermatologie et syphilographie de Paris*, May 1, 1902. (He recommends large doses of mercury and locally adrenalin.)

220. **de Vries.** Ocular carcinoma. *Med. Tydschr. v. Geneesk.*, 1902, 1, No. 16.

221. **de Bono and Frisco.** On the permeability of the conjunctival and nasal mucosa to micro-organisms in respect of intraocular affections. *Arch. di Ottalm.*, viii., 11, 12.

222. **Monesi.** Experimental researches on the pathology of the corneal endothelium. *Ibid.*, xxxi., 1, 2.

223. **Gatti.** Researches on the immunization of the eye against pneumococcus infection. *Ibid.*

224. **Tornabene.** The influence of the bile on functional changes in the retina. *Arch. di Ottalm.*, ix., 1, 2.

225. **Bouveyron.** Hemiatrophy of the face in its relations to lesions of the superior cervical ganglion. *L'echo méd. de Lyon*, 1902, Nos. 2 and 3.

226. **François-Franck.** On the phenomena consecutive to the resection of the cervical sympathetic. *Bull. de l'acad. de méd. de Paris*, July 1, 1902.

227. **Terrien and Camus.** The influence of excitation of the cervical sympathetic on the refraction of the eye. *Arch. d'opht.*, xxii., 6, p. 386.

228. **Holth.** Kinescopy. A new method of determination of the ocular refraction. *Ann. d'ocul.*, cxxviii., p. 241.

229. **Javal.** The perception of radium by the blind. *Bull. de l'acad. de méd. de Paris*, April 15, 1902.

230. **Mohr.** On iodoform poisoning, with special reference to the ocular disturbances. *Arch. f. Augenheilk.*, xlv., p. 184.

231. **Mayweg.** On magnet operations. *Klin. Monstabl. f. Augenheilk.*, xl., 2, p. 1.

232. **Gelpke.** On the diagnostic value of large electro-magnets. *Ibid.*, p. 32.

233. **Duane.** I. Simultaneous parietic mydriasis, subluxation of the lens, rupture of the choroid, with marked involvement of the retina. II. A peculiar form of persistent pupillary membrane. *Ophth. Record*, March, 1902.

234. **Benson.** A note on the value of the fluorescine test. *Ophth. Review*, May, 1902.

AXENFELD (217) recommends that anomalies of the lachrymal apparatus be looked after before any operations on the eyeball. He makes a uniform practice of syringing through the lachrymal passages with physiological salt solution. If there is incomplete stenosis, frequent cleansing is all that is necessary, but if there is complete stenosis or actual dacryo-cystitis, extirpation of the lachrymal sac is the best prophylactic against infection at the operation. Since a great number of the eyes injured by the so-called occupation injuries are lost by sepsis, it is advisable to remove early every diseased lachrymal sac in persons of the working class who are most subject to these injuries.

In three cases of panophthalmitis, HIROTA (218) found the pneumococcus in pure or nearly pure culture as the cause of the affection.

DE VRIES (220) describes the examination of an eye on which exenteration had been done for carcinoma. Carcinoma of the ball is rather rare. Lagrange cites a great number of cases of epithelioma of the conjunctiva or cornea, but cases in which the tumor enters the eye and destroys it are very rare. De Vries, therefore, believes that epithelial tumors of the eyes appear in two forms: as true infiltrating and perforating, metastases-forming carcinomas, and as tumors which spread along the surface and readily recur after removal, but after removal of the base—*i. e.*, after enucleation—do not return nor give rise to metastases.

JITTA.

DE BONO and FRISCO (221) undertook a series of experiments in order to find out whether the mucosa of the nose and eye was permeable for various micro-organisms. To prevent diffusion along the nasal duct, the duct was cauterized and allowed to close by cicatrization in the animals used. Cultures suspended in sterilized water were then instilled into the conjunctival sac. Two hours later the conjunctival sac was washed out with sterilized water and with a canula the aqueous was withdrawn, and, after a second introduction, the vitreous.

The points of entry were previously cauterized. Cultures from the liquids obtained always gave positive results, and many colonies developed of the bac. pyocyaneus, prodigiosus, staph. aureus, bacillus of anthrax and of tuberculosis, when the infecting solutions were left in the eye half an hour or an hour, except in the case of the anthrax bacillus, which required two hours.

Death never occurred, even when the anthrax bacillus was used. (Considerable scepticism as to these results is permissible.—  
TRANS.) KRAHNSTÖVER.

MONESI (222) warns against the use of disinfecting solutions directly in the anterior chamber, since, according to his observation, the corneal endothelium may readily be detached as a result of previous inflammation and by the exit of the lens. He recommends salt solution only, which does not affect the endothelium.

KRAHNSTÖVER.

GATTI (223) has made numerous experiments in order to ascertain whether the immunization of a rabbit with serum obtained by repeated inoculations of a sheep with cultures of the pneumococcus would protect the eye against local inoculations with the pneumococcus. The experiments were entirely negative, both when the serum was used for the entire body and also when it was injected into the anterior chamber. In control experiments the serum proved efficacious against general infection when 2-3 *cg* per *kilo* of weight were used. The aqueous humor in animals immunized in a general way had no influence on pure cultures of the pneumococcus.

KRAHNSTÖVER.

TORNABENE (224) injected bile into frogs under different conditions of illumination before and after. In some cases the chemical reaction of the retina was changed, the formation of visual purple was diminished, and changes in the location of the retinal pigment occurred. This disturbance of the retinal pigment the author believes to be the chief cause of the visual disturbances, particularly hemeralopia in persons with affections of the liver.

KRAHNSTÖVER.

BOUYEYRON (225) in two cases of disease of the apex of the lung observed unilateral atrophy of the face on the same side with enophthalmus and slight ptosis. No pupillary changes were found. He calls attention to a report by Jacquet, who found in a case of right-sided atrophy of the face and left-sided ephidrosis and teleangiectasis of the face, a destruction of the right inferior cervical ganglion (due to disease of the lymphatic glands) and pleuritic membranes at the apex; on the left side Jacquet found a fresh affection of the cervical ganglion, with similar changes in the glands and pleura.

BERGER.

FRANÇOIS-FRANCK (226) distinguishes the symptoms following resection of the cervical sympathetic into permanent and transi-



tory. To the former belong myosis, ptosis, congestion of the conjunctiva, the gums, brain, etc.; to the latter, hypotony, diminution of perspiration, and difficulty in chewing and swallowing. Trophic disturbances or anomalies of physical or psychic development are not observed in the persons operated upon.

TERRIEN and CAMUS (227) found after section and excitation of the cervical sympathetic in the rabbit, cat, dog, and monkey an increased refraction as determined with the ophthalmoscope of 1-25 D. This increase began shortly before the dilatation of the pupil and passed off before the pupil had regained its normal width. The cause is as yet unexplained. There does not seem to be a lengthening of the ball from the action of the muscles. Whether the lens is forced forward or its curvature increased could not be made out with certainty. V. MITTELSTÄDT.

Under the name kinesiopy HOLTH (228) describes a new subjective method of determining refraction, based on the following principle: When an emmetropic eye views an object, such as a white disc 10 *cm* in diameter, at a distance of 6 *m*, through a stenopaic slit which is moved from side to side, an apparent movement of the object viewed is seen, the movement of the object being in the same direction as that of the slit when the eye is myopic, and in the opposite direction when the eye is hyperopic. In emmetropia there is no apparent movement. The cause of this phenomenon is readily explainable from the behavior of the circles of diffusion, as the author shows in illustrations. The procedure may be used for the determination of astigmatism also. The author has devised a particular instrument for the purpose—the kinescope. The method is useful for controlling the tests with type, and in cases of diminished vision, and in simulators. DALÉN.

JAVAL (229), jointly with CURIE, studied the effect of the radium rays upon the blind. In a case of atrophy of the optic-nerve and in one of glaucoma there was no perception of light, while in a case of detachment of the retina and one of blindness from blennorrhœa there was perception of light. Javal concludes from these experiments that blind persons, whose optic-nerve fibres are still intact, are sensitive to the radium rays, and he believes that this method of examination may be used for diagnostic purposes in ophthalmology. BERGER.

MOHR (230) found papillitis, or papillo-retinitis, in two cases of



iodoform poisoning, the optic-nerve affection passing off when the use of iodoform was discontinued.

In the course of ten years MAYWEG (231) has made 92 magnet extractions, 20 being cases in which the iron splinter had passed into the anterior segment of the ball. In all the rest the splinter was in the posterior segment, either in the vitreous, retina, or choroid, or in the orbit after having passed through the posterior wall of the eyeball. In the 72 cases of extraction of the splinter from the interior of the eye, a meridional section of the sclera was made in 47 cases. In 25 cases the splinter was brought into the anterior chamber by the giant magnet and then removed. Of the 47 cases in which the foreign body was removed with the hand- or giant-magnet through the opening of entrance or a meridional section, 21 obtained good vision, 8 poor vision, and 11 became blind, 7 eyes being enucleated or exenterated. Of the 25 extractions with the giant-magnet after a lance incision of the cornea, 6 had good vision, 3 poor vision, 14 became blind, and 2 eyes required enucleation. This would indicate that the meridional section gives the best results.

In a patient whose eye had been penetrated by a splinter of iron seven years before, GELPKE (232) found at the equator a small yellowish prominence pigmented at its apex. The sideroscope did not indicate the presence of iron, but as soon as the Volkmann magnet was brought near the eye the prominence became more marked. After making a meridional section of the sclera the splinter was removed by the magnet and recovery took place.

BENSON (234) finds that but little has been written about fluoresceine as a staining agent for anything but ulcers, and he found that under many conditions the cornea will stain green.

1. Sloughy ulcers stain yellow instead of green.
2. In dendritic ulcers a great deal more than the actual ulcer stains.
3. Occasionally what appears to be a healthy cornea will stain in a patchy manner.
4. Epithelium damaged by caustic alkalies or by acids, or by direct heat, will stain, though the surface be not abraded.
5. The eyes of dead animals stain well.
6. Normal corneæ will stain if they have a good deal of cocaine instilled.

Bikler has stated that corneal endothelium will stain after the

use of cocaine in cases of sympathetic ophthalmia, but of this fact Benson has not obtained confirmatory evidence.

He concludes that the stained part will represent (1) an ulcer not yet covered with epithelium, (2) an abrasion, or (3) epithelium in a dead or diseased condition.

MARSHALL.

### III.—INSTRUMENTS AND REMEDIES.

235. **Re.** Observations on some new remedies in ocular therapeutics (aspirin, dionin, adrenalin, picric acid). *Arch. di Ottalm.*, ix., II, 12.

236. **Kirchner.** On adrenalin, the active principle of the suprarenal capsule in a permanent form. *Ophth. Klinik*, 1902, No. 12.

237. **Rehns and Terrien.** On the action of tetanus toxin injected into the vitreous. *Bull. de la soc. de biologie de Paris*, April 12, 1902.

238. **de Rocca-Serra.** Clinical and experimental study of the ocular affections produced by contact with podophyllin. *Thèse de Paris*, 1902.

239. **Pedrazzoli.** A lid speculum. *Arch. d'ophth.*, xxii., 7, p. 456.

240. **Sulzer.** Notes on verres à la Chamblant. *Ann. d'ocul.*, cxxvii., p. 401.

241. **Jackson.** The value of trikresol as an antiseptic in ophthalmic practice. *Ophth. Review*, June, 1902.

242. **Hansell.** The use of a solution of permanganate of potassium in the treatment of purulent ophthalmia.

RE (235) warmly recommends the four remedies mentioned—  
aspirin in affections of rheumatic origin and as an anæsthetic,  
dionin as an analgesic and specific for corneal phlyctenulæ and  
suggillations, adrenalin as an agent which rapidly produces ischæ-  
mia of the conjunctiva and a specific in spring catarrh, and picric  
acid as a substitute for nitrate of silver and protargol.

KRAHNSTÖVER.

KIRCHNER (236) recommends adrenalin—1:1000—in catarrhal  
marginal ulcers of the cornea. He obtained good results in  
glaucoma when myotics also were used.

REHNS and TERRIEN (237) made experimental studies on rab-  
bits in regard to the action of tetanus toxin. General symptoms  
appeared most quickly after injections into the vitreous, and less  
quickly when subconjunctival injections were made. The first  
symptom was always a spasm of the orbicularis.

BERGER.

According to the investigations of ROCCA-SERRA (238), podo-  
phyllin causes the following ocular affections in workmen engaged  
in using it: œdema of the lids, conjunctivitis, epithelial defects  
and opalescent opacity of the cornea, and iritis. Besides the

visual disturbances there was severe pain and, in consequence of this, insomnia. The affections may be prevented by using protecting glasses.

The speculum suggested by PEDRAZZOLI (239) for opening the lids in cases of extreme blepharospasm has the size and form of Pean's speculum. The branches, which are introduced from the temporal side, are flat, and have a space corresponding to the cornea. When drawn apart they make a rotary movement, so that the lower margin of the branches comes to lie in the retro-tarsal fold.

V. MITTELSTÄDT.

SULZER (240) discusses the advantages of bicylindrical glasses over spherical. The former were discovered empirically by the watchmaker, Chamblant, yet the writings of Chevalier would seem to show that he was already familiar with them. Bicylindrical lenses crossed at right angles are preferable to spherical lenses in aphakia, since they produce no spherical aberration. Also for the correction of astigmatism, bicylindrical lenses are preferable to sphero-cylindrical, since by the variation of the angle of the cylindrical axes the most different grades of astigmatism can be corrected with an accuracy which is not to be obtained with the cylindrical glasses now in use.

BERGER.

JACKSON (241) states that de Schweinitz was one of the first to call attention to the value of this drug as an antiseptic for ophthalmic use, and in a solution of 1 in 1000 it is reliable and unirritating. In this strength it is certainly less irritating than 1 in 10,000 perchloride of mercury, or of formol.

As a basis for solutions of atropine, etc., it is very useful, as it causes hardly any discomfort. He concludes from a general and extended use of trikresol that it is free from the risk of making the eye worse, that it is an antiseptic solution that will keep itself clean, and that it has a distinct germicidal influence when used to wash out the conjunctival sac.

HANSELL (242) uses the permanganate of potash as strong as 1:600 in bad cases of purulent ophthalmia. The eye is irrigated with the solution every twenty minutes.

ALLING.

## BOOK NOTICES.

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**IV. Die Refraction u. Accommodation des menschlichen Auges u. ihre Anomalien.** By Prof. C. HESS, M.D., Würzburg. With 105 text-figures. Separate edition of Chapter XII., of Part II. of the 2d edition of the *Encyclopedia of Ophthalmology* by Graefe-Sämisch. Leipzig, W. Engelmann, 1902.

This large octavo volume of 523 pages is an exceedingly thorough exposition of this fundamental and most important section of ophthalmology. It follows the historic growth of our scientific and practical knowledge of ophthalmic optics, with a good deal of geometrical and algebraic demonstration, without, however, entering into higher mathematics. It is by no means a heavy treatise, but attractive, instructive, and highly suggestive reading. Anybody that wants to elaborate certain points, or solve undecided questions, will find new subjects of investigation and opportunities to round out his knowledge on fairly well elucidated topics. The volume, which may be had separately, should be in particular demand by American oculists, who will be pleased to find a good many American names in the text as well as in the elaborate bibliography.

H. KNAPP.

**V. Spectacles and Eyeglasses.** By R. J. PHILLIPS, M.D. Third edition, revised, with 52 illustrations. P. Blakiston & Son. Philadelphia, 1902. This little book of 109 pages, price \$1, contains a good deal of practical information for the eye surgeon as well as for the optician. The portions relating to bifocal glasses and to prisms have been rewritten.

"The most modern and successful form of bifocal glasses is the so-called 'cemented' bifocals. To the back or front surface of the distance glass is cemented, by means of Canada balsam, a small lens whose strength, added to that of the distance glass,



equals the glass required for near work. The upper edge of the supplemental lens should be ground as thin as possible in order to render it inconspicuous. These spectacles are strong, light, and handsome."

"In still another form of bifocal glass the small supplemental lens is countersunk — that is to say, is cemented into a corresponding concavity ground in the distance glass. Or the distance glass may be composed of two full-sized plano-convex lenses with their plane surfaces in apposition, each of these surfaces being ground out at its lower part, so as to house the small supplemental lens between them. These two forms admit of a reduction of weight and the abolition of chromatic aberration in the heavy glasses required in aphakia. To accomplish the latter purpose the distance lens is made of crown glass and the supplemental lens of flint glass. In this form they are called achromatic bifocals. Their disadvantage lies in the expense of their manufacture."

The combination of spherical, cylindrical, and prismatic glasses is thoroughly analyzed, both in their optical effects, and the best methods of setting them. The decentration of glasses in prismatic combinations is carefully described and provided with tables, chiefly based on the publications of E. Jackson.

H. KNAPP.



*Ora serrata.*

*Orbicular ciliaris.\**

*Corona ciliaris mit  
Processus ciliares.*

*Dr. Reimar fec.*











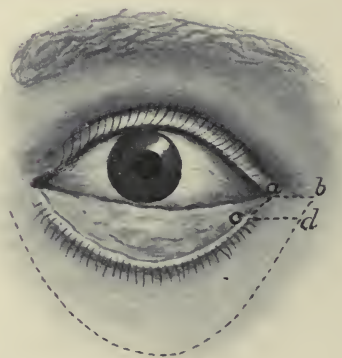


FIG. 1.

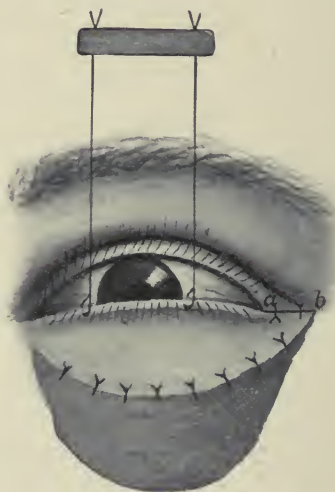


FIG. 2.

## ARCHIVES OF OPHTHALMOLOGY.

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### THE PROPER DIVISION AND FIXATION OF THE SKIN FLAPS IN THE OPERATION FOR CICATRICAL ECTROPIUM TO PREVENT RE-EVERSION.

BY DR. F. C. HOTZ,

PROFESSOR OF OPHTHALMOLOGY AND OTOTOLOGY IN RUSH MEDICAL COLLEGE, CHICAGO, ILL.

*(With two figures on Text-plate III.)*

THOUGH the immediate result of operations for cicatricial ectropium may be very beautiful and the lid borders in perfect apposition, we find usually in the course of a few weeks or months the lid partly or completely drawn away again from the eyeball. After the operation on the lower lid this result is the rule, no matter what operative method was pursued. It is very easy to understand the cause of these frequent partial or complete failures. Cicatricial ectropium cannot be relieved without transplantation of skin flaps; but all transplanted flaps shrink more or less and exert in proportion to their shrinkage a traction upon the skin to which the edges of the flap are attached. The more movable this skin, the more readily it will follow the shrinking flap and the greater will be the contraction of the latter.

In the case of cicatricial ectropium, one edge of the transplanted skin flap is attached to the lid border, its other edge to the skin near the eyebrow or the cheek as the case may be. In either case the lid border is the most movable part; it offers the least resistance to the shrinking flap and is, therefore, easily displaced by it. This is particularly noticeable in ectropium of the lower lid, because it is so much easier for the shrinking flap to pull the lid down than to draw the skin of the cheek up. The lid, therefore, is



everted again, the degree of ectropium depending solely on the amount of the contraction of the flap. As this shrinkage of transplanted skin flaps is inevitable, the recurrence of ectropium is almost a matter of necessity as long as we allow the traction of the shrinking flap to act with full force directly upon the lid border. But the lid will not be displaced and everted again if we put it beyond the influence of this traction force. This can be done, as I have convinced myself in a sufficient number of instances, if, instead of covering the whole wound with one large flap, we divide the wound area into two sections, the one representing the surface of the lid, the other section the wound surface beyond the lid, and cover each section with a separate skin flap; and, furthermore, anchor the flap covering the lid surface (which we may call lid flap) so securely that the contraction of the other flap can have no effect upon it.

**In cicatricial ectropium of the upper lid** several ways are open to reach this desired end. If the eyebrows are absent, we can utilize the cicatricial skin above the border of the everted lid for the lid flap, as I have described in 1896 in these ARCHIVES (vol. xxv., p. 295). A semicircular flap of suitable size, the basis of which is the free lid margin, is outlined in the cicatricial skin and dissected off down to the lid margin; and after the reposition of the lid, the edge of the lid flap is united with the upper border of the tarsus by three or four silk sutures.

If this plan cannot be adopted on account of the eyebrows, we make an incision close along the lid border and after the reposition of the lid provide for a lid flap from some other source. Wolf's flaps and Thiersch grafts are the most available material. I give preference to the Thiersch graft on account of its thinness and lightness; it adapts itself very nicely and evenly to the surface and does not interfere with the movements of the lid on account of its light weight. Such a graft of suitable dimensions cut from the skin of the arm is smoothly spread out over the lid surface and fastened by fine silk sutures to the skin edge of the free border on the one side, and to the upper border of the tarsus on the other side.

After the lid flap of one kind or other is secured in its place, the lid margin is drawn down beyond the horizontal line as far as possible and held in this position by two ligatures passed through the free margin and fixed on the cheek by plaster strips or collodion. This is done for two purposes: first, to immobilize the lid, and, secondly, to stretch the wound surface of the supratarsal region to its fullest capacity. Over this wound then a suitable Thiersch graft is spread so that its edges lap over the surrounding skin; no sutures are used.

The advantages of the division and fixation of the skin flaps here described are obvious: The lid flap cannot shrink very much because its edges are fixed to firm unyielding points, the upper and lower borders of the tarsus; and its contraction cannot turn the lid over, because to do so the traction force must have a fixed point of purchase outside of the lid. The contraction of the skin flap of the supratarsal region, which has a point of purchase outside of the lid, cannot exert any disturbing effect upon the lid margin because its traction is not transmitted to the lid flap as this is so securely anchored to the upper tarsal border that it cannot be stretched or drawn upwards by the contraction of the other flap. If the latter should shrink very much its excessive shortening may draw the whole lid upwards and prevent its perfect closure during sleep, but under no circumstances can it cause a re-eversion.

**In cicatricial ectropium of the lower lid** the same plan of division and fixation of the skin flaps can be carried out successfully, only with this modification, that the lid flap is not anchored to the tarsus but to the tarso-orbital fascia. The tarsus of the lower lid is very small, and normally the lid skin reaches farther down than the lower tarsal border to a slight furrow a little above the infraorbital margin, where the integument passes from the upright plane of the lid into the sloping surface of the cheek. This normal boundary between lower lid and cheek must be re-established, and therefore the lid-flap must not be united with the tarsus but fastened to the tarso-orbital fascia in a line a little above the infraorbital margin. As the fascia is the anatomical contin-

uation of the tarsus, the lid flap thus fixed lies entirely within the boundaries of the lid, and its contraction has no tendency to evert it. And the shrinkage of the large flap on the wound of the cheek is prevented from pulling on the lid margin and causing re-eversion because its traction cannot reach beyond the firm union of the lid flap with the fascia. No amount of traction of the cheek has the slightest effect upon the lid flap or the lid margin.

In cutting the lid flap from the cicatricial skin always present below the everted lower lid, we must bear in mind that this skin contracts considerably as soon as it is dissected up. In order, therefore, to obtain a flap of suitable size, we begin the incision one centimetre below the inner canthus, carry it obliquely down into the cheek to a point about three cm. below the centre of the everted lid margin, then we continue it in an oblique direction upward and outward to a point (*b*, Fig. 1) even with and one centimetre from the outer canthus. This large flap is then dissected up from the underlying scar tissue, and all cicatricial strands and bands are cut until the lid is freed and can be turned up.

The next step is to reduce the overstretched lid margin to its proper length by removing a suitable piece of the lid (except the conjunctiva) near the outer canthus by cutting from *a* to *c* along the lid margin and from *c* to *d* through the flap; the edges *cd* and *ab* are then united by two silk sutures.

Now the lid is drawn up as far as possible and held in this position by two silk ligatures passed through the free margin and fastened on the forehead by adhesive plaster or colloidion. This done, the edge of the lid flap is anchored to the tarso-orbital fascia by silk sutures (Fig. 2). The lid flap should be evenly spread out so as to be in perfect contact with the wound surface; but we must carefully avoid any undue stretching, and should we find that the flap is a trifle short and would be stretched if the sutures are placed very near the infra-orbital margin, it is better to put them through the fascia one or two millimetres higher up. For if the lid flap is unduly stretched, its subsequent contraction would unquestionably produce sufficient tension to draw the lid

margin down and to cause a slight ectropium. Finally, the wound surface below is covered with a Thiersch graft, the edges of which are made to lap over the surrounding skin. No sutures.

The after treatment is the same for the upper and lower lid. Strips of gutta percha protective are laid over the flaps and upon these a suitable gauze compress wrung out of warm boric acid solution ; this is covered by one large piece of protective to prevent evaporation, and over this a layer of cotton to maintain uniform warmth. This whole dressing is secured in place by a roller bandage and left undisturbed for three days. Then it is carefully removed, the flaps are thoroughly cleansed, the overlapping edges of the large flaps are trimmed, and a new dressing is put on, which is changed every day or two as circumstances may require. At the end of the first week the ligatures and the sutures of the lid flap may be removed ; during the second week some simple dressing (like borated vaseline) is kept over the flaps, and after this period no further treatment is required.



CHRONIC EMPYEMA OF THE ETHMOIDAL AND  
FRONTAL SINUSES, WITH EXOPHTHALMOS;  
OPERATION; DEATH FROM MENINGITIS;  
AUTOPSY.<sup>1</sup>

BY DR. ARNOLD KNAPP.

M. P., thirty-four years old; has never had any discharge or occlusion of the nose. According to the patient, seven years ago a swelling appeared near the nose, pushing the eye out. This was operated upon. She ceased treatment before the wound was closed and was comfortable until two years ago, when the condition recurred. This was again relieved by a slight operation. The old condition returned and became more accentuated two months ago, when she experienced severe headache and diplopia.

*On admission*, a heavily-built, healthy woman. The left eye is pushed out and down by an elastic, painless, round swelling, occupying the inner and upper walls of the orbit. V  $\frac{3}{8}$ . Od. normal. The nose is clean. No discharge. No hypertrophies; the outer wall of the middle meatus is bulging inward.

*Operation*, Sept. 18, 1902.—Curved incision along upper and inner orbital margins. In separating the periosteum at the orbital margin, a cavity is opened and a great quantity of thick, chocolate-colored fluid is evacuated. On wiping this dry, the cavity is seen to be formed by the dilated frontal and ethmoidal sinuses extending over the orbit and bounded internally by the inner wall of ethmoidal labyrinth. The outline of the middle turbinal is distinctly visible. The floor of the frontal sinus shows a large central defect; an irregular plate of bone remains at the anterior, external, and posterior margins. The orbital periosteum is thickened and fills in this defect. The os planum is completely

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<sup>1</sup> Read with demonstration of specimen at the meeting of the Section of Rhinology, etc., New York Academy of Medicine, February 25, 1903.

gone; the ethmoidal labyrinth, except for the presence of a few posterior ethmoidal cells, is converted into a bone cavity, showing only an inner and lower wall (middle turbinal). The entire area is lined by a very thin membrane, the old mucous membrane. The bone underneath is smooth. At the edges posteriorly and externally diverticula and septa remain which are smoothed away. The frontal sinus has no lining membrane, and the bone appears superficially diseased, brownish, and can be peeled off like parchment (*tabella vitrea*). A broad opening is made into the nose, throughout the middle meatus, and the middle turbinal is completely removed. Anteriorly the nasal process of superior maxilla is partly resected. Some of the posterior ethmoidal cells, situated far back and next to the septum, are apparently diseased and are opened up externally. The wound is packed from in front.

*Sept. 19th.*—T. 100.6°. P. 90. Complained somewhat of headache. Vomited a considerable quantity of blood.

*Sept. 20th.*—Complained of her throat and also her stomach. Some headache. T. went up to 103.6°. P. 112.

*Sept. 21st.*—A restless night. Complained of pain in the right eye and headache. T. remained at 103°. In the afternoon slightly delirious. Pain in the back of head and neck. Swallowing difficult. In the evening became restless and attempted to get out of bed.

*Sept. 22d.*—T. rose to 104°. P. 100. Partly delirious, though answers questions. Very restless, complains of pain in the head. Palpation of back of neck painful. The wound was dressed. Gauze removed. There seemed to be no retention of pus. The cerebral wall of the frontal sinus healthy. The nose was irrigated. In the afternoon the condition has not changed. She has taken nourishment. The left pupil was found dilated. No change in the eye ground.

*Sept. 23d.*—Restless during the night except when under the influence of morphine. At six o'clock in the morning her condition became suddenly very much worse. Later her breathing was more rapid. T. 106°. Pulse could not be counted, and at 10 A.M. she died.

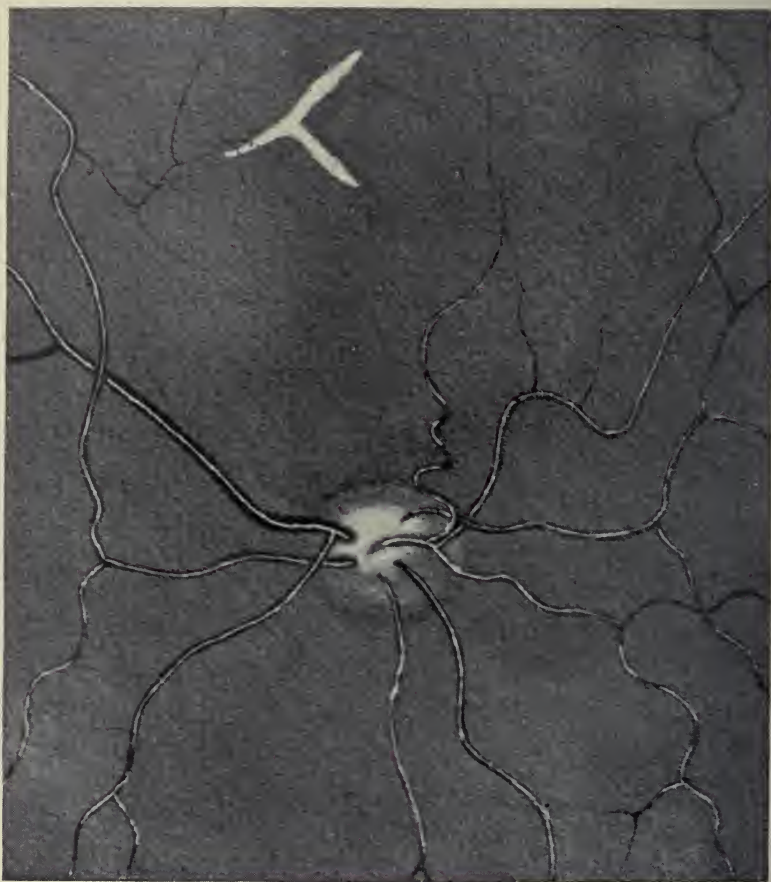
*Autopsy, 8 P.M.*—After removing the calvarium, the dura appeared normal. There was purulent meningitis over the convexity, more on the left than on the right side. On lifting the base of the brain, the right olfactory bulb was found imbedded in

pus. A very pronounced purulent collection was situated further back, surrounding the pons and the anterior extremities of both cerebellar lobes. Pus was seen to continue into the spinal canal. The ventricles contained cloudy fluid. The brain itself and the sinuses were normal. On examining the dura on the floor of the anterior cerebral fossa a small coagulum of blood and pus was seen to cover an opening in the membrane at the posterior extremity of the left cribriform plate. The opening in the dura was round, 2-3 *mm* broad, with thin and discolored margins. The roof of the orbit and of the nasal cavities was removed, showing the defect in the left orbit produced by the operation. There was no retention of pus. The septum and horizontal wall, roof of ethmoidal cells, and orbit remain; there are a few posterior ethmoidal cells. These and the adjoining mucous membrane are covered with discolored granulations, which at one point passed through the bony roof of the lamina cribrosa to the under surface of the dura. The posterior wall of the frontal sinus was normal. The sphenoidal sinus was opened and found healthy. The right cribriform plate was also healthy.

REMARKS.—The active process in this case was a disease of some of the posterior ethmoidal cells, which appear to have been closed off by the dilated empyematous cavity, obstructing drainage and causing an extension upwards, as shown by caries of the lamina cribrosa and circumscribed pachymeningitis. These latter changes are of some duration and presumably not produced by the operation. At the same time there is no question but that the operation started the meningitis under the existing diseased conditions. Examples of the lighting up, so to speak, of a latent meningeal process are not unusual.







T-shaped isolated rupture of the choroid near yellow spot, with normal acuteness of sight.

## Y-SHAPED RUPTURE OF THE CHOROID IN THE MACULA REGION WITH RETENTION OF GOOD VISION.

BY DR. J. J. MILLS, OF BALTIMORE, MD.

(*With text plate IV.*)

J. C., aged about nineteen years, a student from W. Va., consulted me June 16, 1902, on account of an injury to the right eye, which had occurred two days before whilst playing baseball. He was struck over the right eye by the flying ball and knocked down. He was not rendered unconscious, but stunned for a few moments. Upon recovering he found himself quite blind in this eye. Some domestic remedies were applied by one of the instructors of his college. The eye soon became painful and he was brought to me two days after. Upon inspection there was found a moderate degree of circumcorneal injection, pupil dilated, anterior chamber shallow, and about one third filled with blood. Vitreous hazy with floating opacities, so that no view of the fundus could be obtained. There was no external injury to the globe, and tension was normal. Shadow perception alone remained. A collyrium of atropia and bandages were applied and opium stupes ordered. June 18th, globe less injected. Opacity still obscured the fundus. Fingers seen at three feet. Iodide of potash in 10-grain doses given three times daily. June 19th, fingers at nine feet with difficulty. June 27th, fingers at thirteen feet and eye diverged. Indistinctly, in macula region, whitish streaks could be made out which I believed to be due to choroidal rupture. All inflammation having subsided, he was now permitted to return to his home, but with a bad prognosis as to the future usefulness of the eye. He returned to me on July 14th; his right eye had now resumed its normal position. Pupil still slightly dilated. Upon examination of fundus, media are all

found perfectly transparent, and a Y-shaped rupture of the choroid, at the posterior pole, is now distinctly visible. The macula is situated between the prongs of the Y. Vision is a little over  $\frac{20}{20}$ , or about the same as before the injury.

The accompanying plate was drawn by me at this sitting, that is, about a month after the injury. This case is interesting not only from the shape of the rupture, but from the fact that the macula region was so closely embraced by the injury, and vision unaffected.

A CONTRIBUTION TO THE PATHOLOGY OF ANOMALIES OF THE VESSELS AND THE FORMATION OF STRIPES IN THE RETINA.

BY DR. RUDOLF SCHILLING, FREIBURG-IN-BR.

(With Plates I.-II. of Vol. XLIII., German Edition.)

Translated from *Arch. f. Augenheilkunde*, xliii., March, 1901, by Dr. WARD A. HOLDEN.

THE ophthalmologist finds not infrequently a tortuousness of the retinal vessels without being able to discover a direct cause for it in the condition of the fundus otherwise. This tortuousness of the vessels has always excited considerable interest, and recently has received much attention in literature. According to Gloor (21), to whom we owe one of the latest and most exhaustive papers on the subject, the matter has not been sufficiently discussed in literature, and therefore the presentation of new cases seems justifiable.

Through the kindness of Professor Manz and Professor Baas I had the opportunity of studying and making drawings of two cases of this sort which were distinguished by their combination with peculiar stripes in the retina.

CASE I (Fig. 1, Plate I.).—P. S., aged nineteen, a carpenter. Father living and healthy. Mother died of cancer of the stomach. As a child the patient had frequent eruptions on the head. In April, 1899, he had an attack of typhoid and remained seven weeks in the hospital. Since then he has always been feeble, has severe headaches and frequent vertigo when he stands. At times he has convulsions with loss of consciousness. It is said that he was run over by an electric car, causing injury of his foot and



long-continued loss of consciousness. Since then he has had about ten other attacks.

*August 2, 1899*, he was admitted to the medical clinic with recurrent typhoid. In the hospital he had further attacks in which he gritted his teeth, rolled his eyes, twisted his body, and exhibited opisthotonus and striking movements with his legs and arms.

*November 29th*, he was sent to the eye clinic to have the fundi examined. Discharged here on December 1st, he soon returned to the medical clinic on account of his headaches, and remained there until January 2, 1900.

*August 2, 1899*.—A man of medium constitution, anæmic, with pale mucous membranes. Thorax well shaped. Sounds at the apices of the lungs equal. Limits of heart and lungs normal.

*October 2d*.—No hyperæsthesia for a needle prick on the body, but sensitiveness on the head. Tapping the occiput or forehead causes pain radiating back through the entire head. The facial nerve normal on each side; the tongue protrudes straight. Motility of the limbs normal, except that the toes of the left foot since the accident are harder to move than those of the right. Strength fair. Standing with closed eyes there is a tendency to fall backward. No ataxia. Knee-jerks present.

*October 5th*.—The right upper lid droops. The right naso-labial fold is less pronounced than the left when the teeth are exposed. Continual complaint of headache.

*October 30th*.—Facial paralysis scarcely noticeable. No ptosis.

*Diagnosis*.—Hysteria, cephalalgia nervosa. Recurrent typhoid.

*Condition of the eyes*, November 30th.—Externally normal. Pupils respond well. Media clear.  $R\ V = \frac{6}{30}$ ,  $L\ V = \frac{6}{8}$ . Visual field: L normal limits; R slight contraction for green. Central scotoma for blue, red, and green and increased size of the blind spot for each eye.

*Ophthalmoscopic* (Fig. 1).—Right eye. The disc is of a grayish-white color. The blurred margins pass over into the surrounding retina which near the disc is cloudy, partly diffusely, partly in stripes. The area between the disc and macula is grayish-white with red showing through here and there. The macula itself is occupied by a more intense, differently shaded opacity, whose temporal margin is bounded by a vertical silvery stripe. From the disc some small tortuous vessels run nasally and temporally, partly concealed near their origin by the white tissue of the disc.

The point of exit of the large vessels is covered with a grayish,

brownish-red plaque with its base in the middle of the disc and projecting to a pointed termination forward in the vitreous. The arteries pass from the disc in their usual course, but a tortuous branch is found in the upper temporal quadrant, and a smaller one runs toward the macula. All the veins, on the contrary, either near the disc or farther away, are very tortuous, but all lie in the plane of the retina. Their peripheral terminations are very tortuous and sometimes of corkscrew shape. The veins are here and there looped about the arteries and anastomose among themselves.

Besides these vascular anomalies the fundus exhibits peculiar white stripes which are more or less in connection with the vessels. The trunk of the upper artery is bordered on each side by a white line extending from the disc and passing over the vein where it crosses before the artery. This white stripe follows the temporal branch of the artery without immediately joining it. Later it separates entirely from the artery and follows the main vein as a broad stripe. The white stripe here is bordered by lines of pigment particularly below where the pigment forms little arched figures. From the point where the vein breaks up into its tortuous branches the white stripe describes a regular curve in the retina and ends in two branches. In this part of its course it runs partly under and partly over the veins. A second stripe without connection with the disc appears on a second branch of the artery, then passes to a vein, and dividing follows two branches of the vein. In the periphery are some independent white stripes, partly free, partly lying on venous branches.

The inferior temporal artery and veins are in their beginning surrounded by a broad white stripe which extends with a broad base from the opacity in the disc. Then it passes downward, filling the space between the artery and the first lateral branch of the vein, and divides at the intersection of the vessels mentioned into two stripes, one of which runs downward, passing beneath the main vein, and reaches a venous branch which it accompanies both above and below.

The upper broader portion of the stripe continuing the direction of the original stripe accompanies the artery first along its upper margin and then along the lower, then divides where the venous branch winds round the artery; the former runs some distance upward while its direct continuation following the artery passes over abruptly into a broad white patch partly covered with

pigment. This is a line of pigment running parallel to the stripe, curved at its ends, and composed of small masses of pigment. At its end near the disc it passes into a line of pigment running downward obliquely beneath the vein. Here also the peripheral veins are bordered by longer or shorter free-lying stripes. The infero-nasal vein also is accompanied by a white stripe which appears first on one side of the vessel then on the other.

The stripes have a dull grayish-white color, particularly near the disc. Further in the periphery they assume a more tendinous lustrous white color and appear in part to be composed of several bundles of fibres.

*Left eye.*—Disc scarcely veiled, no vascular changes. In the posterior portion of the vitreous a grayish-white opacity and a punctate similar opacity in the macula.

CASE 2 (Fig. 2, Plate II.).—Mrs. A. L., aged fifty-eight, admitted to the clinic June 21, 1898. Father died of ascites, mother of an affection of the lungs, a brother of an intestinal disorder, and two sisters of phthisis. Three others of the family are alive, but not altogether well. The patient was healthy as a child. At the age of thirteen, inflamed eyes—which were healed without affecting vision—and enlarged glands. Married at twenty-six. One healthy daughter. No miscarriages. For some months twitching of the face not accompanied by twitchings elsewhere, and gradual diminution of vision, particularly in the left eye, so that now she cannot read with this eye. Fluttering before the left eye. No headache.

*June 21st.*—R V =  $\frac{5}{7}$  with — 1. L V =  $\frac{1}{3}$  with — 1.

Left: central scotoma.

Pupils react normally. Tension in both eyes normal.

Several old scars are visible at the margin of each cornea. Media clear.

*Ophth.*—Right: disc slightly reddish, with a flat excavation. Vessels normal.

Left: disc of normal color, flat excavation. Veins slightly enlarged and tortuous. Arteries normal.

In the macular region and below yellowish foci. About the disc are many old extravasations. Here and there in the foci absorption is manifested by the presence of pigment masses. The hemorrhages lie particularly along the course of the veins.

*June 24th.*—R V =  $\frac{5}{7}$  with — 1. L V =  $\frac{1}{30}$  with — 1.

*June 26th.*—Heurteloup.



*June 30th.*—L V =  $\frac{1}{3}\frac{5}{8}$  with - 1. The extravasations of blood are largely absorbed and partially transformed into gleaming white masses. The venous congestion is less, the arteries are better filled.

*July 7th.*—L V =  $\frac{1}{1}\frac{1}{8}$  with - 1.

*July 22d.*—L V =  $\frac{1}{1}\frac{1}{2}$ . The temporal portion of the disc is pale and somewhat atrophic. The foci in the macula have been absorbed and only here and there are small remains of blood visible.

*July 24th.*—Discharged with directions to take iodide of potassium.

*April 4, 1899.*—L V =  $\frac{1}{6}$ . Optic disc atrophic, above and below linear hemorrhages. Long white stripes sometimes overlying the vessels.

*November 11th.*—R V =  $\frac{5}{8}$  with - 1. L V =  $\frac{1}{6}$ . L. ophth.: partial atrophy of the disc up and in. In the upper-inner quadrant of the retina white formations with tortuous veins over them. At the macula choroiditic pigment degeneration.

*December, 1899.* Ophthalmoscopic picture (Fig. 2). Left eye: The disc is pale, with a flat excavation up and out. About it is a reddish-gray zone which passes over without a sharp line of demarcation into the normal color of the retina. The macular region is partly atrophic with accumulations of pigment. Similar punctate and linear pigmented foci are to be seen in the upper nasal and temporal quadrants. Besides these one sees some narrow, dull, yellowish-white stripes in the deep layers of the retina, extending toward the disc but not reaching it.

One's attention is chiefly attracted, however, by a peculiar-shaped white figure in the inner-upper quadrant, following the course of two veins. These two veins arise from the upper-inner portion of the disc and pass somewhat divergent upward. They appear rather small and lack a definite light reflex. The vessels branch at about the same distance from the disc, and the terminal branches run through a network of stripes of a milky-white color. From this network white stripes run back along the adjacent margins of the two veins. The connective-tissue mass consists of an elongated plaque (see figure) sending out processes along the vessels.

Since the complexity of these cases offers some difficulty in interpretation, I wish to consider the tortuousness of the



vessels and the retinal stripes separately, and give a *résumé* of the literature, based on that presented by Gloor, but adding various cases which seem to me to fall into these categories.

The first description of this affection appeared in Mauthner's text-book, in 1867. He says: "The vessels at times present a marked tortuousness. Usually arterial and venous trunks running parallel are affected. The pulsating excursions may then be very evident, either on the disc or more frequently in the retina."

Mauthner adds an account of a case observed by Schirmer, in which, besides extensive teleangiectasias in various parts of the body and on the lids of the left eye, there were marked varicosities of the retinal veins, so that the curvings of the vessels were not only lateral but also antero-posterior. The arteries, in course and calibre, were entirely normal.

Magnus (42), in 1872, designated with the name "varicosities of the retinal veins" an anomaly of the fundus which, in respect of the tortuousness of the veins, had great similarity to the case described by Gloor (21).

The case reported by Samelsohn (62), in 1873, was in a man of forty-nine, whose vision in the right eye had been poor for two years, since a dark spot had appeared in his field of vision. Besides sclerectasia and a dark movable opacity of the vitreous, two red spots were seen in the lower portion of the disc, which had the appearance of extravasations of blood, but proved to be convolutions of small vessels springing from the two superior venous trunks. Both of these trunks farther from the disc were tortuous, and at two points there were evidences of other newly developing branches. In the lower half of the disc one large vein turned back in its course, and the other broke up, just after entering the disc, into four branches, one of which appeared to be in direct connection with an arterial vessel.

Jakobi (33) reported, in 1874, three cases of partial abnormal tortuousness of the vessels.

The first was in a corpulent woman of sixty-six, whose vision had been poor for two years. In the right eye there was a red spot in the course of the vessel, apparently a

vein, which proved to be composed of convoluted vessels. It was not clear whether there was a plexus with anastomoses or simple tortuousness of the vessel.

In the second case he found in a feeble, unmarried woman of sixty-seven, who had poor vision and frequent frontal headaches, a marked tortuousness of two small veins near the disc.

The fundus of the third patient, an unmarried woman of eighty-six, with poor vision, exhibited near a choroidal plaque in each eye two large looped veins near the disc.

Chodin (11), in 1875, described a case of tortuousness of the veins, in a man of thirty-eight, with hyperopia and diminished vision, whose vision had been bad since childhood. The veins, which united on the disc to form a common trunk and appeared broader than normal, were tortuous in corkscrew fashion, and ran in different planes. The tortuousness began at some distance from the disc and increased toward the periphery.

Benson (6), in 1882, described a case of extreme idiopathic tortuousness of both arteries and veins.

In the same year Nettleship (49) reported two cases of marked tortuousness of the retinal veins in two eyes that were otherwise healthy.

Mackenzie (41) also, in 1882, reported a case of marked tortuousness of the retinal veins, in a man with emphysema of the lungs, and in the following year another case in the eye of a girl of twelve, who was hyperopic and had suffered with pains in the forehead.

Horrocks (31) found the retinal veins very tortuous in the right eye of a paralyzed girl, aged nine, with *nævi* of the face and conjunctiva.

Czermak (12), in 1883, described a case of prepapillary vascular loop in a weak girl of thirteen, with a small irregular prognathous skull and flat bridge of the nose. In the left eye, medullated fibres passed upward and downward from the disc. The arteries and veins were very tortuous. An artery passed forward from the disc in a spiral loop, and returning to the disc continued as the inferior temporal artery.

Hirschberg (29) presented a drawing of the right fundus

of a healthy man, whose left fundus was normal. In the left eye the retinal veins were looped and tangled so that they could scarcely be disentangled clinically. They did not, however, project into the vitreous.

Remak (61), in 1885, described three cases of persistent hyaloid artery in one of which the vessels were quite tortuous.

In 1886 Galezowsky (19) published a drawing of tortuous retinal veins seen in a woman with mitral insufficiency. The number of visible venous vessels seemed enormously increased. The arteries were normal and no other changes were noted.

Under the name "*perivasculitis retinae*," Scheffels (63), in 1891, described a case of tortuousness of retinal veins in a boy of eighteen with hereditary syphilis. He observed first a whitish discoloration on the superior nasal vein. A week later the vessel, for a distance of 1 *p. d.*, seemed transformed into a uniformly broad gleaming white band. The course and calibre which before had been normal now changed. Centrally from the white area the vein was reduced to a thin filament. Peripherically it was dark red in color, dilated and enormously tortuous up to its terminal twigs, some of which lay in the retina and others were elevated above it. Analogous changes were later found in other veins. Under inunction treatment the changes gradually receded and the calibre of the vessels became normal, although the tortuousness remained permanently.

A unique case was described by Axenfeld (3) in 1894. The retinal veins for the most part ran toward the periphery and at the outer limit of the visible ophthalmoscopic field sank into the choroid, while the papillary veins were but slightly developed. I refer to this case because the latter veins were very tortuous.

Frost (17), in 1896, pictured a case of tortuousness not only of the veins but also of the arteries, and in other cases accidentally came across partial tortuousness of one or more veins.

In the same year Axenfeld (4) reported two cases of anastomoses after thrombosis in the region of the central vein.



1. A man of forty-eight with arterial sclerosis and the results of apoplexy. In both retinae sclerosis of the arteries and obliterated veins. At many points tortuous anastomosing vessels connected the veins around the thrombosed areas so that there was no great stasis.

2. A man of sixty, with arteriosclerosis. Total thrombosis of the venous trunk supplying the inferior halves of the retinas. Within three months a large anastomosing vessel developed from a point peripheric to the thrombus and passed up to join the main superior vein.

In Oeller's (52) atlas (1897), Figure E, Plate VI., represents tortuous retinal vessels, the arteries being but slightly affected. Figure C, Plate VII., shows retinal veins tortuous in the periphery and of double their normal calibre.

Gloor (21), whose paper I have followed for the most part up to this point, in his publication in 1897, describes the fundus of a man of twenty-three, who had suffered for four years from cough and expectoration and for two years from hemorrhages. A week before the examination he noticed the sudden appearance of a cloud before the right eye.

Right eye normal externally. Opacities of the vitreous. Disc visible. Circumscribed hemorrhages at its nasal margin. In the macular region a large dark-red hemorrhage with lighter margins. Arteries narrow, veins very tortuous in the periphery of the fundus.

Left eye. In the disc a spirally twisted vein extending upward. Veins in the neighborhood of the disc relatively straight, but tortuous in the periphery. In looking to the right a convoluted vein is visible. Below, some veins are interrupted here and there by blurred gray patches. At places the veins are bordered with white lines. Many hemorrhages, one in the macular region. The tortuous veins here and there disappear in the hemorrhages and emerge again unchanged in direction.

Würdemann (78), in 1898, described a thrombophlebitis of the central vein with complete blocking in a boy of eight. The veins were dilated and tortuous and there were hemorrhages. Vision was lost and later there was proliferation of connective tissue on the disc, in the vitreous, and at the



ciliary region, and sclerosis of the tissues leading to glaucoma.

Elschnig (15) reported in 1898 two cases of anastomoses of the retinal veins.

The first was in a man of seventy-six with atheroma of the valves of the heart and albuminuria, who for five months had noticed a gradual diminution of vision, and had a mild attack of apoplexy, leaving a left homonymous hemianopsia.

In the fundus the beginning of the superior papillary vein had a greatly thickened wall and a peripheric twig was dilated. All the twigs of the superior papillary vein running toward the macula were connected by anastomosis vessels of different calibre, but all very tortuous. The twigs bending round the macula were in the same manner connected with the inferior temporal vein. In the left eye above the disc a small network of twisted small vessels passed from a retinal vein.

In the second case, likewise in an old man with arteriosclerosis, so far as the senile changes in the refractive media permitted them to be seen there were many tortuous vessels connecting different veins.

Eversbusch (16), in 1899, reported a very instructive case: There was a thrombosis of the central vein of the retina, caused by trauma, which had led to the formation of a plaque of new-formed tissue before the disc and to narrowing and obliteration of the trunks of the superior and inferior temporal veins and to convoluted anastomosing vessels in the region of these veins.

Levin (37), in 1899, observed a girl of eighteen with evidences of previous rachitis, who had had poor vision since childhood and in the course of years noticed a gradual failure of sight. The right eye was normal except for a hyperopia of 6. D. The left eye, otherwise normal, exhibited the following ophthalmoscopic picture: The disc was uniformly red, with blurred margins. At the nasal margin there were signs of radiating stripes. The retinal vessels, both arteries and veins, were remarkably tortuous, so that the tangle of crossing vessels had the Medusa-head appearance.

Shortly after their emergence from the disc, the main

branches divide and their twigs form numerous corkscrew curves, which can be followed to the extreme periphery. At many places the vessels cross and form large recurrent arches and loops. The curves all lie in one plane. The calibre of the veins appears to be increased and that of the arteries narrowed. The line of reflex is particularly broad on the veins. H + 7. D.

Pick (54) in the same year published two cases of bilateral tortuousness of the vessels.

The first was in a man of fifty-six with empyema. On both sides there were remains of pupillary membranes, hyperopia, (R + 5. D), and incipient cataract. Arteries and veins were excessively tortuous and offered a picture similar to Levin's drawing. The changes were more marked in the right eye than in the left.

The second case was in a man of fifty-four with empyema, catarrhal symptoms, and moderate arteriosclerosis. The eyes appeared normal externally, but the veins, which were apparently increased in number, were tortuous. The calibre seemed to be increased, but not uniformly along the course of the vessel. The corkscrew twistings did not lie in a single plane. In the left eye there was an anastomosis to the nasal side of the disc. Hemorrhages along the veins. Colloid excrescences at the macula. Emmetropia in both eyes.

Reimar (60), in his paper on embolism of the central artery, describes a case in which in the normal left eye the veins had an unusual branching and were abnormally tortuous on the disc, while in the right eye, besides the symptoms of embolism of the central artery, short dark-red lines on the disc were seen, which proved to be the superficial portions of an excessively tortuous vein, whose deeper parts were concealed by the cloudiness of the disc. The other portions of the vessel were of normal appearance.

Seydel (72) described and pictured the fundus of a woman of thirty-one, who suddenly saw a cloud before her right eye which markedly interfered with vision. There was marked tortuousness of the superior temporal vein and at intervals it had a chalky-white sheath. The larger temporal branch

broke up into small tortuous twigs, concealed for a distance by hemorrhages.

When, after this abstract of the literature, we seek the etiology of these vascular anomalies, we find that the attempted explanations are as numerous as the objective findings.

Pick (54) collects the clinical pictures according to their etiology and distinguishes congenital and acquired vascular anomalies, the latter being due either to local eye diseases or to general diseases.

To begin with, it should be remarked that tortuousness of the vessels may exist even under physiological conditions. Mauthner (44, p. 250) warns against regarding them as pathological. Schmidt-Rimpler (67, p. 236) says: "At times the veins, without other anomalies in the fundus, are tortuous and even varicose." Schweigger (70) says: "The veins run a less direct course than the arteries, and even in physiological conditions may be quite tortuous."

The criterion of a congenital anomaly, according to Leber (35, p. 521), is, that the curved vessels lie in a single plane and the loops do not extend forward as in hyperæmia.

In how far this statement is justified by anatomical and embryological conditions or by experience is hard to determine. One must suppose that when any force causes the retinal vessels to become tortuous the direction of the loops will depend upon the resistance; thus the vitreous comes into consideration, and normally this must offer considerable resistance. But in many pathological conditions it is easy to see how the resistance on the part of the vitreous might be greatly lessened. Then there are the persistent hyaloid arteries and the arteries which form a spiral loop in the vitreous and then return to the retina. Cases of the latter have been reported by Czermak (12), Hirschberg (29) Wachtler (74), Szili (73), Liebreich (40), Günsburg (25), Hirsch (27), Bondi (8). Hirsch (27) believes that there was a progressive series extending from the tortuous arteries of young hyperopes up to the loops in the vitreous so that one cannot believe the latter to have any connection with a persistent hyaloid artery. The analogy does not hold good,



however, so far as our cases are concerned, for the loops are from the disc and the tortuousness which we have been considering is chiefly in the periphery where there is no question of loops into the vitreous.

In respect of the location of acquired vascular tortuousness, the cases reported show that a constant rule is even less possible than in the case of the congenital variety, although the pathological process here is likely to cause an elevation of the vessels above the plane of the retina; in Elschnig's (15) case the anastomoses of corkscrew shape lay in the plane of the retina.

The other points distinguishing a congenital from an acquired tortuousness are, the bilateral nature of the anomaly, the participation of the arteries in the tortuousness, an increase in the number of the vessels, the location of the tortuousness, the formation of anastomoses, and finally the combination with other structural anomalies in the eye. Gloor considered the fact that the veins in both eyes were affected as an evidence of congenital origin. But it is known that other congenital vascular anomalies of the retina are frequently unilateral. Thus, for example, prepapillary vascular loops are in many cases unilateral, but again some are bilateral.

In regard to the division of the anomaly into arterial and venous cases there is no particular difference, since in many of the cases the veins alone were affected and in many both arteries and veins in equal measure.

Nor can an increase in the number of vessels be considered of diagnostic value, for it must be remembered that an abnormal fulness of previously invisible vessels may render them visible and thus an increased number of vessels be simulated.

Nor can the peripheric location of the tortuousness be regarded as evidence of its congenital nature, since in Schefel's (63) case in which the pathological nature of the tortuousness was proven, the anomaly though existing in almost all the veins of the two eyes was found only in the periphery.

In respect of the formation of anastomoses it may be said that they are of little importance, since Gloor says: "When



one knows what important rôles are played by anastomoses in the nervous system in general, one will readily understand that they may occur with the slightest disturbance."

A certain diagnostic value appertains, however, to the simultaneous occurrence of other developmental anomalies in the eye, as for example Czermak's (12) case with abnormal conformation of the face and skull, epicanthus, medullated nerve fibres, and prepapillary vascular loop; Remak's (61) case with persistent hyaloid artery, Pick's (54) and Levin's (37) cases with remnants of pupillary membrane and hyperopic pseudo-neuritis. That the last anomaly in particular stands in some relation to tortuousness of the vessels is evident, but the tortuousness in such cases is usually on or near the disc.

Still more difficult than the diagnosis of congenital vascular anomalies is the attempt to form an idea as to their cause and manner of development. We may here first advance the question with Axenfeld (3, p. 16): "Is there an anomaly in the strict sense of the word, the vessels being originally formed in their present location and size, or have we to do with a condition acquired in foetal life?" In respect of the latter possibility there are three ways of explaining the condition: a limitation of space in the foetal eye, a disturbance of circulation during development, and anomalies in the growth of the vessels.

As for the first point, Frost believes that the frequent association of tortuousness of the vessels with hyperopia permits us to suppose a causative relation between the two. Hyperopia means incomplete development, and the retina might remain in its early folded stage, and thus the vessels have an opportunity to become tortuous. One must then assume, as Levin remarks, that the folds later disappear while the tortuousness of the vessels remains. Landolt suggests another connection between the two anomalies, namely, that in consequence of the smallness of the highly hyperopic eye the vessels cannot extend to their normal length, and hence are tortuous. As for the second point, our knowledge of the development of the retinal vessels is still too incomplete to permit us to draw conclusions. As

for the third point, Gloor sees in the uniform involvement of all the veins an evidence of an active increase in the length of the vessels, and he contrasts these vascular anomalies with all those changes associated with dilatation of the vessel lumen which are secondary. In the earlier publications such a distinction was not made, in the nomenclature at least, since simple tortuousness of the vessels was described as "varicosities of the retinal veins" (Schirmer), and "varix-like tortuousness of the vessels" (Jakobi). Yet Jakobi (33) believed that the vascular tortuousness described by him was not a simple distension but due to an actual anomalous elongation, somewhat similar to plexiform and cavernous angioma.

At this point I would recall the interesting cases reported by Schleich (65) and Seydel (71), which probably are to be regarded as congenital arterio-venous aneurysms of the retinal vessels, and are of interest to us on account of the very great tortuousness of the vessels. The combination of tortuousness of the vessels with great dilatation of the lumen, as is well shown in these cases, seems to me to be an indication that a definite separation of these two vascular changes cannot be made. For although the latter may be referred to the conditions brought about by the arterio-venous aneurysm, still the possibility exists that in the development of this anomaly similar conditions obtain, as we have discussed them above from the point of view of the active increase in length.

If we now consider the causes which in later life lead to tortuousness of the retinal vessels, we come first to choked disc among the local ocular causes. In this state the veins are often dilated and tortuous, while the arteries are but slightly changed. The tortuous veins then lie in most cases in different planes. The deeper portions of the loops are frequently concealed by the oedema of the tissue.

In glaucoma also the compression and obstruction of the veins at the margin of the excavation cause tortuousness, mostly limited to their central portions.

Thrombosis of the veins and sclerotic changes in their walls, which bring about a slow blocking of the lumen, also

give rise to great tortuousness and the formation of anastomoses. Here either the veins are very tortuous behind the narrowed point, or anastomoses arise by one of two ways — either more or less tortuous vessels of longer or shorter course connect two different systems of vessels or distant portions of a single system, or spindle-formed twisted twigs connect a single vessel about its thrombosed section.

It is not possible to say in how far the anastomoses consist in the dilatation of existing capillary connections, and in how far upon the formation of new vessels. At any rate anastomoses are found only when there is a slow blocking of the vessel, for in Würdemann's (78) case, in which the blocking was sudden and complete, no anastomoses formed.

The cause of the thrombus may be a trauma from hemorrhage into the optic nerve or into the central canal of the vitreous exercising pressure on the central vein, or it may be due to perivasculitis.

The nature of these inflammatory processes, which through cellular infiltration of the circumvascular lymph sheaths and vessel walls lead to narrowing and gradual stoppage of the lumen, has been explained in but few cases. Scheffels (63) regarded the perivasculitis of the retinal veins in his case as the first manifestation of hereditary syphilis. Whether marantic thromboses and thromboses forming in the course of infectious diseases may be etiological factors we do not know. Nor should the arteriosclerosis, often observed, be regarded too frequently as the cause; for while the patients of Jakobi, Axenfeld, and Elschnig were old people with atheromatous changes, this cause was not likely to have existed in Seydel's young patient.

In what has preceded we have referred often to the view of Pick in regard to the relation of these vascular anomalies to general diseases. We may add that Galezowsky (19) regarded the initial insufficiency in his patient as a causative agency. Yet it is not certain whether here, as in Oeller's (52) case with leucæmia, it was not rather a casual concurrence of both affections.

If we now compare with the published descriptions the clinical picture in our first case, the patient Stocker, a cer-



tain similarity of the vascular symptoms with those in Gloor's case cannot be overlooked. The veins alone are tortuous, the anomaly is limited to the periphery of the retina, and the venous curves lie in the plane of the retina. In both cases there were anastomoses. Yet in our case there were wanting places where the trunk divided into fine branches, which formed a convolvulus and united to form a single trunk again. Another difference lies in the limitation of the affection to one eye, while in Gloor's case it was bilateral.

The process extending forward into the vitreous in our case is worthy of consideration. Comparison with similar structures suggests a congenital anomaly. The persistence of a hyaloid artery first suggests itself. Nor does the lack of a connection between the obliterated tract and the posterior surface of the lens speak against this supposition.

When we come to the consideration of the second ophthalmoscopic change—the connective-tissue strands and striæ in the retina, and look over the reports of similar cases in the literature, we find them in considerable number, and the varieties in which this condition appears have led many writers to undertake a classification of the material.

Accordingly one distinguishes prevascular, circumvascular, and retrovascular striæ, the last being divided again into retinitis striata after inflammation and striæ retinæ after detachment of the retina.

The first category is characterized by striæ which chiefly, if not altogether, lie anterior to the retinal vessels, in the retina itself, and extending thence into the vitreous. This definition is similar to that of the clinical picture which Manz (43) designated retinitis proliferans, and the question arises whether there is but a slight difference between the two clinical pictures, or whether there are marked differences. In order to discuss this question, I wish to offer a *résumé* of the cases reported.

The first mention of prevascular striæ was by Jakobi, in 1874, in the case already cited (33): "Furthermore, the retina contained whitish strands which appeared first on either side of the artery running downward and immediately



bordered the vessel and then united to form a single strand. These strands lay doubtless over the plane of the larger retinal vessels, as was evident when they crossed the vessels.

Berger (7), in 1882, described three cases of unilateral connective-tissue formation in the disc and retina.

In his first case, two lustrous tracts, composed of fibres running parallel in their long direction—one beginning near the inner margin of the disc, the other from the outer pigment ring,—converged above, and ended with frayed-out interlacing margins. These tracts lay near the inner surface of the retina and optic nerve, and were perforated by branches of the central vessels.

In the second case, two similar tracts extended out from the disc.

In the third case, a lustrous silvery tract was seen extending from the inner margin of the disc, tortuously in a horizontal direction over the connective-tissue ring, and ended with a broad, frayed-out end in the inner-lower portion of the retina. One artery and one vein of the central vessel system appeared through two perforations in this connective-tissue tract.

Schleich (66), in 1890, published a case in which, long after hemorrhages had taken place in the neighborhood of the larger retinal vessels and no trace of blood remained, a fine white tract was seen running from the disc along a vein toward the periphery in the left eye, while in the right a complicated system of white tracts was seen raised above the level of the retina, and extending from a large mass near the disc. There were small accumulations of pigment. Here also the vessels ran beneath the white stripes.

Banholzer (5), in 1892, described an interesting case pictured in Haab's *Atlas* (26), that is valuable on account of the detailed pathological examination, and is of clinical importance for us.

A woman was struck on the left eye by a rack on a wagon. There were various injuries of the anterior segment of the eye and the following condition was found in the fundus. The disc had rather blurred margins. It is surrounded by

a light ring from which two white tracts slightly divergent extended downward nearly to the equator. The retinal vessels ran beneath these elevated strands. Only below the disc did one large vessel, greatly curved, run above the prominent white elevation.

All the other cases of this sort that I found in the literature exhibited the characteristics of typical retinitis proliferans in a more or less marked degree.

Our second case (Mrs. Lichtle) doubtless belongs in the same category.

The difference between these cases and the cases of typical retinitis pigmentosa, notwithstanding the clinical variations of the latter, lies in the progressiveness of the latter, while the former are more stationary. The peculiar features of the former cases—the striated character of the deposits, the slight elevation, and the lack in some cases of a connection between the connective-tissue formations and the disc—do not seem to depend upon a fundamental difference from retinitis proliferans. For there are transition forms between the striated formation in the cases of Jakobi, Berger, and Banholzer and the plaques of greater lateral extent and sometimes triangular form that were observed in the cases of Schleich, Purtscher, and our own.

The second point, the difference in height, is variable and does not particularly distinguish the two.

In regard to the third point, Purtscher (58, p. 43) speaks as follows: "A further constant condition in all cases is, as Manz stated, the close relation between the arrangement and extension of the connective-tissue formations and the disc and vascular supply of the retina. Either we find the disc partly or wholly covered by the membrane, or the disc is immediately surrounded by the connective-tissue masses, or the connective-tissue tracts lie in the periphery of the fundus but always follow the course of the larger vessels. And even in these rarer cases the disc remains the anatomical centre and is connected with the denser connective-tissue masses by veil-like, membranous, or striated connective-tissue masses which accompany the larger vessels toward the disc. In other rare cases tracts of connective-tissue pass

from the temporal margin of the retina to the macula, which usually remains free from the typical changes."

In Banholzer's case, the arrangement of the membranes about the disc which appears as in a hole, and in Berger's and Schleich's cases the connection with the margin of the disc is evident, but in Jakobi's, Purtscher's, and our own case this is wanting, for the white sheath about the veins cannot be followed from the connective-tissue mass to the disc. However, one may remember a fact in Banholzer's anatomical examination, according to which some connective-tissue may be demonstrated with the microscope which cannot be seen with the ophthalmoscope.

In respect of the etiology, Jakobi gives no clew. Berger, taking into consideration the completely preserved vision, supposes the affection to be a neuroretinitis of early infancy when the tissues have a greater capacity for regeneration. In the other cases the new formations are referred to hemorrhages, and in our case the clinical history shows a connection between the new connective tissue and the previous hemorrhages. I shall not discuss the nature of this connection since this has been done in great detail in the papers by Banholzer, Purtscher, and Fünfstück (18).

The second group according to Praun contains all the cases of white lines or tracts along the vessels, caused by inflammation or sclerosis of the vessel wall. The ophthalmoscopic picture produced by thickening of the vessel wall may differ greatly, ranging from white lines along the blood column to a complete transformation of the vessel into a white cord. Nor are these cases of uniform etiology. Even under physiological conditions, according to Mauthner (44, p. 321), one may find white lines along the vessels on the disc and near it, while this condition farther out in the retina usually indicates changes in the vessel wall itself. Such changes may be of secondary nature, following all sorts of retinitis (Mauthner, p. 320), or they may be almost exclusively in the vessel walls. The most marked cases of this sort, in which the vessels are replaced by white cords, have been seen a number of times.

Nagel (46) found in a healthy young man with a good



heart nearly all the arterial branches in both eyes, from their emergence in the disc to their finest branches, represented by white lines, partly sharply outlined and lustrous, partly dull and blurred. The broadest lines exhibited a bright-red line in the centre and only a few small arteries were normal. Some of the peripheric venous branches were transformed into white lines. The disc was covered by a whitish translucent prominent mass with new-formed vessels. In the fundus were some ecchymoses. Nagel regarded this case as a representative of some retinal affections, and designated it as a chronic inflammatory, slowly progressive process beginning in the walls of the vessels as a proliferation of connective tissue or a sclerosis, extending to the connective-tissue portions of the parenchyma of the retina, and from the arteries passing over through the capillary system to the veins. He sees in it an analogy to similar affections of the central organs that begin with a proliferation of nuclei and cells in the adventitial layer of the vessels.

Wedl (77) described a similar case in which the main branches of the central artery were chalky white, and Iwanoff (34) found proliferation of nuclei in the adventitia about the vessel on all sides.

In Jaeger's *Atlas* (32) three cases (Figs. 50, 51, and 75) are pictured and described, in which the vessels are narrowed and in part are interrupted by white stripes. In Fig. 75 there are found yellowish figures composed of ribbon-like stripes in the macular region, but independent of the vessels. There are no particular etiological factors mentioned.

Next to these cases came those in which the vessels have white sheaths, or portions of the vessels are transformed into white stripes, as were observed in the cases previously mentioned of thrombosis of the retinal vessels, the formation of the stripes and the thrombosis either being due to a common cause—an inflammation or sclerosis of the vessel wall or the stripes being caused by the obliteration of the vessels by the thrombus.

While in the cases already described the white tracts followed the course of the vessels, or were in direct connection with them, we find in the third group a series of changes in



which the striæ both in direction and in location in the layers of the retina are more or less independent of the vessels. A division was suggested by Praun (56) of these retrovascular striæ into (1) retinitis striata after inflammation, the striæ consisting of new-formed connective tissue between choroid and retina or in the retina alone, and (2) retinal striæ after detachment, the striæ here arising from absorption of the retinal pigment or from a deposition of fibrin between the unchanged retina and choroid. I do not coincide with this view, because Praun himself must admit that actual formation of cicatricial striæ may follow detachment, and further because the etiology is not so clear in all cases that a classification from an etiological point of view is not yet possible.

In taking up the question as to the relation between detachment of the retina and the formation of striæ, we find that considerable study has been devoted to this subject, particularly in recent years.

Even in 1859, Liebreich (39) established this relation. In discussing the color of the detachment and its dependence upon the nature of the liquid, he said: "The best insight into the relations is obtained by the study of cases in which the contents of the sac are not homogeneous but consist in part of clear liquid, in part of opaque coagulæ." He adds: "The coagulæ remain when the retina, after the disappearance of the liquid, becomes attached again, and they form bluish-white stripes between the retina and choroid and at times extend over a great portion of the retina and thus furnish a clew to the pre-existing condition."

These statements were later confirmed by various authors. Onisi (51) says: "There is no doubt but that after detachment of the retina light stripes are found which are of different origins and sometimes resemble the striæ of retinitis striata. But on the other hand it was impossible in our observations to refer the striæ in all cases to previous detachments. Since in many cases both striæ and detachments existed in the same eye, it is quite possible that both are dependent upon a common basic affection. But it is not true that in the cases we observed the striæ were

found first in the detached or reattached portion of the retina."

Purtscher (59), in 1891, published a case of spontaneous recovery from detachment which I mention because of the curious pigmented lines that were found, although the author does not take up the question of the origin of retinal striæ. He says: "The retina is everywhere reattached. At the points where it was detached there are extensive pigment changes, partly in the form of large points and spots, but mostly in the form of dark wavy lines radiating from the disc upward and outward. The retinal vessels pass unchanged above the pigment deposits and seem to stand in no relation to them." [The rare, but well-known angiod stripes, resulting from retinal hemorrhage. H. K.]

Möglich (45), in his dissertation in 1891, collected numerous cases of spontaneous recovery from detachment, and called attention to the formation of white stripes in the fundus. "A very frequent finding after recovery from retinal detachment consists of the so-called retinal strands. These are lustrous bright white or pale yellowish-white striæ of a breadth varying from that of a fine line up to several times the width of a retinal vein. At times they are found at the boundary line of the healthy portion, and are bordered by pigment masses of different sizes."

Caspar (10), in 1895, took up the question anew after observing in three cases of detachment the transformation of subretinal fibrous coagulæ into typical retinal striæ, and believed himself justified in assuming that the so-called retinal striæ are nothing else than a rare terminal stage of retinal detachment. He believed that there was no occasion to speak of a particular chorio-retinitis striata.

He described his first case as follows: "Above the macula which was included in the detachment, one saw a bluish-white stripe extending upward and outward beneath the retina. Two weeks later, when the retina had partly returned to its place, one saw in the formerly detached part issuing from the disc a mass of darkly pigmented, broad, short stripes, without sharply defined margins, all extending nearly in a horizontal direction. Some sharply outlined,

branched pigment stripes extended to the region outward and above the macula. Among the latter were three long, sharply outlined, gleaming white stripes, in part branched and bordered with pigment, which ran almost radially toward the disc but did not quite reach it. Their breadth was considerably more than that of the largest retinal veins. In the largest of these stripes one could recognize definitely the line which two weeks before had been seen shining through the detached retina. The stripes stood in no relation to the blood-vessels. They lay, furthermore, in the plane of the retina."

In the second and third cases pigment stripes passed out in opposite directions from the disc, growing broader and either running a straight course or, as in the second case, being curved like the tail of a comet. The stripes included a light streak in their middle and divided the retina into an upper normal and a lower pathologically altered half. In the latter were found white stripes independent of the pigment figure. One of them could be followed from the attached into the detached portion of the retina.

Similar to these cases is that of Natanson's (47) described in 1896. He describes a case of typical retinitis striata, with the following characteristics: (1) The presence of long, narrow, white striæ; (2) the formation of broad, pigmented bands, which begin near the disc, and, following a course like that of a comet's tail, extend to the extreme periphery of the fundus, separating the fundus into two portions, one of normal appearance, the other abnormal and containing the white stripes.

Since in Natanson's case no detachment was observed and the history indicated no such occurrence, I do not consider Natanson's view justified when he accepts the opinion of Caspar, that the ophthalmoscopic picture of chorio-retinitis striata is due to the reattachment of a detached retina. On the contrary, it appears to me that since the white stripes in Caspar's case were visible before the retina became reattached, and that in the second case the stripes extend from the detached into the normal portion of the retina, Onisi's view, that both detachment and the de-



velopment of striæ are of common etiology, is the more probable.

Praun (56), in the publication of 1895, already mentioned, described a case of detachment, in which at the margin of a prominent fold there was a pigment border. After puncture of the retina and evacuation of the subretinal liquid there appeared, after complete reattachment of the retina, a horizontal stripe under the black pigmented margin, and this ran horizontally through the entire fundus and was interrupted at some points by pigment depositions above it. By it the fundus was divided into two halves pathologically different. The picture recalls the characterization of chorio-retinitis striata by Natanson, differing from it in that the stripe passed 1 *p.d.* beneath the disc, and in that the upper half of the fundus remained free from pathological changes. But exactly these facts seem to show that the clinical picture of chorio-retinitis striata is not so definite but that one must recognize transition and less sharply characterized forms in respect of pigmentation and the formation of striæ. To the latter seem to belong Caspar's first case and Purtscher's case, which latter, despite the etiological accord, in its ophthalmoscopic picture differs from the requirements of Natanson.

In summing up we come to the conclusion that retinal stripes may well be the final stage of a retinal detachment, yet need not have this origin in all cases, nor even in cases in which at the same time detachment of the retina and the formation of striæ are found, for the latter need not be the result of the former, but perhaps the result of a common cause, as Onisi has already suggested.

The recent cases of striæ retinæ have been collected by Görlitz (23), who distinguishes two forms which can hardly be regarded as identical. The first is characterized by dark stripes with a grayish to grayish-brown color, often bordered by lighter stripes, and mostly extending in a radial direction from the disc toward the periphery. In this category come the cases reported by Plange (55), Holden (30), Walser (75), Pretori (57), and Dunn (14), which appear clinically to be a distinct group, since the changes usually occur simultaneously



in both eyes and usually leave the acuteness of vision normal.

In Plange's (55) case there were striated formations of dull brown color, arising from a layer of opaque, grayish-white, lustrous tissue about the disc and extending toward the periphery in a radial direction. At first they were two to three times as broad as a central vessel, but gradually they grew narrower and broke up in the periphery into small plaques and stipplings of the same color. The brown striæ were bordered by broader light stripes which centrally passed over into a large zone surrounding the disc.

In Holden's (30) first case there radiated from a cloudy zone about the disc a system of branched dark-brown stripes, composed of fine dots, and having the width of a papillary vein. In the right eye some of these stripes were in places bordered by light stripes twice as broad.

Walser (75) described two similar cases. In one radial striæ extend to the periphery from a gray ring surrounding the disc and half a *p. d.* distant from it. Their course is similar to that of an irregularly tortuous vessel. Some divide dichotomously, and others give off twigs which running concentrically with the disc give off twigs anastomosing with the neighboring striæ. The second case is similar. The gray zone has a notched margin and is partly surrounded by white. Furthermore a small artery is bordered by white lines.

In Pretori's (57) case there was a dark ring about the disc and half a *p. d.* from it, from which dark stripes of brownish, slightly violet color ran to the extreme periphery, branching irregularly and anastomosing frequently with one another.

The case reported by Dunn (14) was characterized by more or less sharply outlined stripes of varying breadth and length, which in the neighborhood of the disc are intimately connected and then extend toward the periphery. These are broader near the disc than in the periphery.

All these striæ run beneath the vessels, crossing them in such a manner that their independence of the vessels is manifest.

The second group, according to Görlitz, is characterized

by gleaming white, sharply limited narrow striæ, often bordered by lines of pigment. These striæ mostly run obliquely across the fundus, or in case these run toward the disc they include a certain portion of the fundus, leaving the rest fairly free. Clinically these cases are distinguished by being limited usually to one eye and by a diminution of vision. Görlitz includes in this class the case of Jaeger (32), that of Caspar (10), and that of Praun (56). The cases of Jaeger (Figs. 73, 74), which I have not alluded to before, are fully described by Onisi, and I believe also that most of the other cases collected by Onisi under the name *retinitis striata* and the three last cases described by Holden (30) as well, belong to this class.

The characteristic features of this class may perhaps be extended so that, besides the white color of the striæ, their sharp outlines, and their frequent borders of pigment, we may add that the striæ consist of continuous elements running in a parallel direction, and often frayed out in the periphery. While the bands of the first group, when carefully examined, are seen to consist of numerous, individual points, they do not have a regular course, do not grow narrower in the periphery as the others do, but broaden out and end in grayish-white, more or less pigmented foci, and also in their course here and there pass into broadened white or pigmented foci, and often at such points exhibit a slight difference in level. The vessels all run anteriorly to these striæ, sometimes bending over them, so that from the parallax displacement one recognizes that at such points they are raised above the ordinary level.

In discussing the etiology of all these formations one might assume from the similarity of the cases in the first group that the etiology was the same in all. Yet the writers hold quite different views on the subject.

According to Plange (55), the striated pigment deposits in the retina are the result of hemorrhages which lead secondarily to a hyperplasia of Müller's supporting fibres. The development from hemorrhages could be clearly followed, since, unlike the intense hemorrhages in the macular region which led to irregular piling up of pigment and

partial destruction of the pigment epithelium, at the points where the hemorrhages were less intense and did not recur at exactly the same places, pigment deposits remained after each hemorrhage, and interlacing gave rise to the brown stripes. The location of these striæ must, because of the intact condition of the pigment epithelium and of the rod-and-cone layer (as shown by the normal vision), be anterior to the outer layers and posterior to the vessels—*i. e.*, in the middle layers of the retina. The grayish-white portions in which dark stripes lie are of later development and, according to Plange, due to secondary changes, possibly hyperplasia of Müller's fibres.

Holden (30) also observed the development of these stripes from hemorrhages. In one large hemorrhage that, in the course of weeks, began to clear up from below, a brown Y-shaped stripe gradually developed in connection with the upper margin of the hemorrhage.

Dunn (14) first suggested that from the appearance at certain places one might suppose that the process was an inflammatory one, "severe enough to leave the straight direction and leave behind it small hemorrhages." Then, when his case remained unchanged throughout the period of observation and gave no support to this idea of its origin, he rather accepted the view of Plange, leaving the question open why the hemorrhages assumed so strange a form, from what vessels they came, and why they were limited to the outer layers of the retina.

Walser (75) offers three possibilities by which the condition might arise.

First, it might be retinitis, for which would speak the spots in the periphery, the points which might be regarded as colloid excrescences, and the collections of small masses of pigment. But in order to explain the formation of the striæ one must assume either a limitation of the retinitis to the parts later occupied by the striæ, or a diffuse retinitis, particularly intense at the places where the striæ develop. The rôle of the lymph vessels radiating from the disc, as described by Schwalbe and His (69), is not accorded much consideration by Walser since the existence of these vessels is denied by many.



The second possibility is that the striæ develop from hemorrhages occurring before birth or in early infancy, which, instead of disappearing, as they usually do, for unknown reasons remain. A hemorrhage, in the sense of Plange, is to be excluded on account of the grayer tone and stationary condition in these cases, while in Plange's case there was an actual brown color, and the process continued to develop over a period of years.

The third possibility depends upon the fact that Gowers (24) observed in neuritis concentric folds, and when the swelling was intense also radial folds in the outer layers of the retina. In the region of the folds there might be a proliferation of pigment, and an inflammation of the retina here might cause an opacity of the deeper layers. Where the inflammation extended beyond the pigment stripes it would explain the white borders of the latter. The concentric course of the pigmented striæ and the diminution in breadth of the radial striæ toward the periphery would agree with the character of the folds.

Pretori (57), however, believes that the condition may be a congenital one.

And for the second group also an explanation is extremely difficult. The great variations in direction and form which these striæ, unlike those of the first group, show, leads readily to different explanations. Holden (30) believes that for these also hemorrhages might be regarded as the cause, and he says: "Both the so-called retinitis striata and also the other variety with the brown spots arise possibly from striated peripheric hemorrhages in the deep layers of retina through different metamorphoses which these hemorrhages undergo . . . for we know that the final result of retinal hemorrhages may be either spots of light color or of pigment." It is recognized, however, that no transition forms are found between the two varieties; and furthermore that there is not only a difference in color but also in the distribution of the pigment — numerous small points of pigment arranged regularly in a line on the one side, and marginal, irregularly heaped up, and irregularly distributed pigment on the other hand. The frequent evident plastic



character of the white striæ suggests their development from the organization and substitution of some formations (exudations, coagula) by connective tissue. It must still be an open question, however, to what degree these are primary inflammatory processes, to what degree there is detachment of the retina, what is the location of the striæ in the retina, and what part the choroid plays in their production, because of the difficulty of determining these things with the ophthalmoscope and the lack of pathological reports.

If after considering the cases described in the literature we now return to our own we find that the second case belongs to the group of prevascular formations designated as striped retinitis proliferans. The classification of the first case offers great difficulties, for here the characteristics of the two groups are combined. The fundus exhibits places in which the prevascular location of the striæ is unquestionable, and other places in which the striæ clearly lie beneath the vessels and appear to run through the fundus quite independent of the vessels. Furthermore, in the case of most of the striæ there is a connection with the disc or with the cloudy zone surrounding the disc, while other striæ first make their appearance in the peripheric course of the vessels. When we recall that the classification of those cases on which this paper is founded depends more or less upon external characteristics, and that we are unable to classify sharply defined clinical pictures on a genetic or etiological ground, it is not surprising that there should be transition forms between the two groups, and it seems desirable to regard the ophthalmoscopic picture in our case as representing one of these transition forms.

In conclusion, the further question arises, What relations exist between the formation of striæ and the tortuousness of the vessels in our cases?

In the second case we are justified in regarding the tortuousness of the vessels as secondary, for in the first place the course of the affection showed that at the beginning of the stasis in the fundus the veins were but slightly tortuous, but later, when the connective-tissue deposits formed, the tortuousness reached the grade shown in the drawing (Fig. 2).

From this it appears that the blood current was interrupted by the connective-tissue deposits and by the changes in the venous walls so that tortuousness resulted. Such vascular anomalies are characteristic of retinitis proliferans.

The conditions were different in our first case (Fig. 1). Here no direct connection between the two anomalies was evident. Onisi (51) says of retinitis striata: "The retinal vessels in general exhibit few characteristic changes except an occasional well-marked tortuousness of peripheric venous twigs." In some instances, however, the tortuousness seems to stand in close relation with the formation of striæ, since (p. 15) "at the places in which the striæ end in white spots the overlying vessels curve over them, indicating that the stripes must have a considerable thickness"; and (p. 17) "in the periphery at the places where the white striæ end there are considerable differences in level and tortuousness of the vessels."

The fundus in our case, however, did not present such conditions. In the regions where the number of striæ was greatest the vessels were often but slightly if at all tortuous, and on the other hand tortuousness existed in areas where there was no sign of striæ.

Nor in our case could one find the connection which exists in thrombosis of the retinal veins between the white bordered or obliterated vessels on the one hand and the anastomoses and tortuousness on the other, as was clearly shown in the cases reported by Scheffels, Axenfeld, Elschnig, and Eversbusch.

The absence of a pathological connection between the vascular anomaly and the formation of striæ, and further the absence of an etiological factor for both anomalies, justifies the assumption that both changes were of congenital origin.

My thanks are due to Professor Manz and Professor Baas for permitting me to make use of these cases and for friendly advice in regard to the study of them.

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## THE ANTISEPTIC TATTOOING OF THE CORNEA.

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Translated from *Arch. f. Augenheilk.*, xxxix., 4, August, 1899, by Dr. WARD A. HOLDEN.

THE paper by Dr. von Sicherer in the *Archiv für Augenheilkunde*, xxxiv., p. 22, on the sterilization of Chinese India ink for tattooing the cornea, rightly calls attention to the fact that the operation causes the greater irritation when the ink used is not sterilized and is of inferior manufacture, containing a greater number of capsule bacilli.

Von Sicherer says: "The genuine ink contains fewer bacilli than the imitation, and the finer sorts fewer bacilli than the cheaper." My observations agree wholly with this statement.

In 1869 when I began to tattoo opacities of the cornea the army surgeon, Weber, visited my clinic. He had been in the Chinese campaign and said to me: "If you wish an ink for tattooing, I can give you a stick that must be the best ink one can obtain, for I took it with my own hands from the Emperor's writing table when the Summer Palace was looted." With this imperial ink I began my tattooing, and Pornier in the first report in the *Union méd.* in 1870 stated that no evidences of irritation were observed. For years I have used this ink without seeing any inflammation arise.

But it is only too well known that inflammation may arise when the ink contains bacilli and particularly when the instruments used are not properly sterilized. I know of one case. A lady on her wedding journey brought her husband to a colleague, who advised that a macula of the cornea be tattooed. This was done and panophthalmitis resulted.

Thanks to the efforts of an influential physician no legal proceeding followed.

Trousseau in the *Annals d'oculistique*, March, 1899, reported a very sad case of destruction of the eye from iridocyclitis, with blindness of the other eye from sympathetic ophthalmia. In this case an adherent leucoma was tattooed, which I have always regarded as dangerous. At the same time he spoke of severe inflammation after tattooing what he remembered as a simple leucoma.

All the bad results hitherto published were in cases of adherent leucoma with thinned scars, in which the entrance of septic material is made possible, and also the anterior chamber may be opened to infection from injurious elements in the conjunctival sac.

Since my Parisian colleague reported his cases not without the intent to injure the operation, for he adds to the report the disconnected statement, "I am persuaded that one has greatly exaggerated the cosmetic and optical effects of the procedure," I permitted myself, as the introducer of the operation, to reply (*Annals d'ocul.*, Apr., 1899): "Early in my career I learned of the fatal result of a chalazion operation. The patient, operated on by Velpeau, succumbed to an erysipelas. Since then I have been called in consultation in a case of suppuration of the entire cornea in consequence of purulent ophthalmia, arising twelve hours after the extirpation of a chalazion. In another case both eyes were lost from infection with contaminated instruments with which chalazia had been removed from each eye.

"Were I to take the trouble I might collect numerous observations of this sort, but even if in secret I cherished that desire, I would not succeed in diminishing the number of the daily extirpations of chalazion. Very likely, the same would be the case if the matter under discussion was tattooing."

We should thank von Sicherer for advising that Chinese ink as pure and fine as possible be used and that it should be sterilized before use. For years I have used a 1:2000 solution of bichloride for that purpose, and lately I have placed the paste of India ink in a hot-air sterilizer before using.



Perhaps nowhere is tattooing so much done as in my clinic, yet I repeat, as I said thirty years ago, that aseptic tattooing is entirely without danger. But in order to avoid a possible infection the number of instruments used must be as few as possible.

We use only a broad needle, which is dipped in the paste. The disinfected lids of the well cocainized eye are held apart with the thumb and index finger of the left hand, thus steadying the ball. The patient will then hold the eye stiller than when a lid holder and a fixation forceps are used. At the same time the freely movable lid serves excellently to wipe off the superfluous ink from the cornea and thus to permit one to see how much he has tattooed and how much remains to be done. When one does the operation for optical purposes it is absolutely necessary that a speculum be not used, and the lids left freely movable.

I assert again, as our Russian colleagues also have done, that the value of tattooing for optical purposes is not yet sufficiently appreciated, when one abstains from adding by the operation new opacities about the original corneal macula. As I am accustomed to say to my pupils, "We are, in respect of the tattooing operation, *encore dans l'enfance de cet art.*"





FIG. 1.—Keratitis bullosa. Peripheral section, showing membranous formation on the surface, detached from Bowman's membrane and forming arches through the thickened epithelium.

## ON THE HISTOLOGY OF BULLOUS KERATITIS IN GLAUCOMATOUS EYES.

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(With Text-plates V. and VI.)

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ALTHOUGH the subject of bullous keratitis as it occurs in eyes the subject of iridocyclitis, interstitial keratitis and glaucoma has received much attention, the pathological histology of this condition is not definitely settled, and hence the report of the examination of two eyes thus affected is not unworthy of record.

CASE I.—M. B., a widow, aged seventy, a patient in the Hospital of the University of Pennsylvania.

*Clinical History.*—The patient presented herself for treatment on the 24th of October, 1901, with the statement that on the previous night pain had begun in the left eye, very severe in nature, which was followed by rapid deterioration of vision. She had used convex reading glasses for more than twenty years and convex glasses for constant wear for five years, and during this period had been much worried by inflamed eyes, lachrymation, photophobia, and conjunctival injection, for which she had from time to time received treatment from competent ophthalmic surgeons.

The vision of the right eye was  $\frac{6}{2}$ . With + 4 D., 0. 75 was read at 23 cm. The cornea was slightly hazy, the conjunctiva injected, the optic disc round and contained a small cup. The field for white was normal. The vision of the left eye was  $\frac{6}{60}$  and was unimproved by glasses. The cornea was exceedingly hazy and



needle-stuck, the pupil semi-dilated and fixed, the fundus could be indistinctly seen, and a large glaucomatous excavation was visible in the nerve-head. The patient continued to attend the Eye Dispensary, and under treatment the glaucomatous symptoms which had been manifest in the right eye disappeared, but those in the left eye continued. Operation was not performed.

When Dr. de Schweinitz took charge of the service, in September, 1902, or nearly a year after she had first reported at the Eye Dispensary and six years after the first inflammatory signs had appeared in her eyes, she presented the following ocular conditions: O D, V =  $\frac{6}{22}$ . With suitable convex spherical correcting glasses vision rose to  $\frac{6}{7.5}$ . The field of vision was normal in all respects, the cornea clear, the anterior chamber of proper depth, and the tension normal. The left eye presented the appearances of advanced glaucoma. Light perception was absent, tension + 3, the cornea exceedingly hazy, the iris dimly seen and atrophic in appearance, the sclera discolored, and the episcleral vessels coarsely injected. The lens could not be studied through the opaque cornea, the surface of which was roughened. In both eyes there were well-marked follicular granulations in the conjunctiva, very abundant in the lower retrotarsal folds, doubtless due to the the unintermittent use of eserine for nearly a year. At periods varying from a few days to a week the patient would return on account of pain, great lachrymation, and great increase in the bulbar injection, these attacks always being associated with the formation of a large bulla in the centre of the left cornea.

Enucleation was advised, and on the 9th of October, 1902, Dr. de Schweinitz removed the affected eye in the usual manner, with prompt relief of all symptoms. Up to the present time there has been no sign of renewal of the glaucomatous symptoms, which are recorded on the case books as having been present in the right eye when the patient first reported.

There are no facts of interest in the patient's general history. In vague terms she has sometimes been rheumatic, but physical examination failed to reveal organic lesion. The urine was normal, but there were some signs of atheroma of the blood-vessels, not more marked, however, than would be expected in a woman of her age.

*Macroscopic Examination.*—The central part of the cornea and the area directly below the centre is occupied by a single large



FIG. 2.—Bullous keratitis. The anterior wall of the cornea is composed of a thin layer of epithelial cells. At the left there has been superficial ulceration of the cornea and destruction of Bowman's membrane.



bulla. On cutting the eyeball in half, the lens was found in position, the anterior chamber shallow, the retina thinned, allowing the choroidal pigment to show through it, and the optic nerve cupped.

*Microscopic Examination.*—The bulla on the centre of the cornea measures 2.2 mm in diameter. In sections in celloidin it has collapsed and the thin walls are folded and project laterally beyond the point at which the epithelium is reattached. Its anterior wall is composed of epithelial cells alone, which show a moderate amount of change. The basal cells are polygonal in form, instead of cylindrical, as is the case with the normal foot cells of the corneal epithelium. Those of the succeeding layers are swollen and frequently exhibit fine vacuoles surrounding the nuclei. The nuclei are distorted, displaced to one side, and show beginning fragmentation, particularly on the surface. In the centre of the bulla the number of layers is greatly increased. Laterally, however, the epithelium regains its normal thickness, although this is very variable, and the surface is made quite irregular by the removal of the superficial cells over numerous small areas. At the point of attachment the basement cells become cylindrical in form, and continue so to the periphery of the cornea. The intercellular spaces are widened, here and there broadening into vacuoles, which contain coagulated fluid and an occasional leucocyte. Towards the limbus the epithelium is separated from Bowman's membrane by many round cells, in which are imbedded a few vascular twigs—*i. e.*, pannus tissue. The episcleral tissue is œdematous and infiltrated.

Extending from the extreme periphery, between Bowman's membrane and the epithelium, is a membrane varying from 7 to 9  $\mu$  in thickness, which has a homogeneous appearance, except in places where it has been forced away from its adhesion to Bowman's membrane. Here it shows a distinct fibrillar structure, as it arches upward through the epithelial cells. It does not reach as far as the central bulla, and takes no part whatever in the formation of its wall. In sections cut some distance above the centre of the cornea, where the bulla does not appear, this membrane is present throughout the entire width of the cornea, and, as the drawing shows (Fig. 1), is in many places separated from Bowman's membrane by layers of epithelial cells, through which it forms distinct arches, the largest of which measures from 0.5 to 1.25 mm in diameter. In sections treated with Van Gieson



solution it stains a pinkish red color, brighter than that of the corneal lamellæ, and its fibrillar appearance is more apparent. Its peripheral terminations are continuous with fine fibrils of connective tissue passing out into the subconjunctival tissue beyond the limbus. The membrane evidently represents a condensed layer of connective tissue, originating at the limbus in the pannus tissue, and spreading inward toward the centre of the cornea.

Bowman's membrane is present undisturbed throughout all of the sections examined. The nerve canals which cross it as fine, dark lines, which are scarcely perceptible in the normal eye, are here unusually broad. The substantia propria is of normal width, and shows no decided signs of œdema. The endothelium on Descemet's membrane is considerably altered. The cells are flattened and are much farther apart than in the normal eye, spaces the width of two cells intervening in places between adjoining cells, especially in the periphery of the cornea. The posterior surface of the cornea is covered with a layer of coagulated fluid which fills up the space between the iris and the cornea, in the angle of the anterior chamber.

The iris is adherent to the cornea for a distance of about 1 mm in front of the opening of the canal of Schlemm, so that the filtration angle is closed all around. The iris is atrophic, and its fine stroma is replaced by thick, interlacing meshes of connective tissue, which surround and compress the thickened blood-vessels. There is an increased amount of pigment imbedded in the stroma in the form of irregular clumps.

The ciliary bodies show an atrophy of the muscular tissue and conversion of the vascular processes into solid cords of connective tissue, which has undergone hyaline change and contains a deposit of lime salts.

The lens is in position, and is normal in appearance.

The retina shows cystic cavities in its anterior portion. The membrane is much thinned, the ganglion cells have almost entirely disappeared, a few distorted cells with retracted processes alone remaining. Mueller's fibres are prominent and are spaced apart. The cells in the nuclear layer are thinned out; the rods and cones are also fewer in number than normal, their outer ends are degenerated, and the individuals tend to form in irregular tufts, between which small cavities are evident as the indication of a previously existing œdema. The retina is everywhere adherent to the choroid, but there is no proliferation of the pigment

epithelium. Here and there the cells are raised in small projections, apparently by the presence of fine droplets in the cells, as described by Wedl and Bock in beginning colloid change in the retinal pigment cells. The vessels have very much thickened walls, a point well shown in sections stained by Van Giesen. They contain red-blood corpuscles, but show no thrombi. The optic-nerve head is excavated to the depth of 1 mm. The nerve tissue is atrophic and the intervaginal spaces are broadened.

*Diagnosis.*—*Absolute glaucoma ; bullous keratitis ; degeneration of the retina ; excavation and atrophy of the optic nerve.*

CASE 2.—W. V., a man aged fifty-four, consulted Dr. de Schweinitz on the 18th of May, 1895.

*Clinical History.*—Seven years prior to this visit, while chipping a piece of steel with a cold chisel, something struck his eye which gave him some temporary inconvenience but of which no great note was made, although almost from the first muscæ were observed before the injured eye. Two months later vision failed markedly, and he consulted a competent ophthalmic surgeon, who informed him that the failure of vision was due to glaucoma and advised immediate iridectomy, which was successfully performed. Pain and inflammatory reaction in the eye, which had been present prior to the operation, stopped, and although there seems to have been no restoration of vision the eye gave him no serious inconvenience. He came for advice because of attacks of vertigo and some pain and inconvenience after the use of his eye.

Examination revealed the following conditions: Vision of O D nil; upward iridectomy with well-placed pillars of the coloboma; at the corneo-scleral margin at the upper part of the coloboma a small cystoid cicatrix. With some difficulty the lens was made out to be entirely opaque and presenting the ordinary appearances of black cataract; tension slightly +. V of O D with + 1.25° axis 150,  $\frac{8}{8}$ ; media clear; pupil prompt; disc round; small physiological cup; surface of the papilla slightly congested. The field for form and red was absolutely normal.

Suitable glasses were prescribed and the patient was not again seen until the 4th of September, 1902, when he returned with the following history: One year previously the cataract of the right eye had been removed by a surgeon whom he consulted, but his statement as to the exact character of the operation was not very clear, and it may be that no attempt was made to remove the lens but that the cystoid cicatrix was incised, for it is difficult to

understand why any surgeon would remove the lens from an absolutely blind eye of this character. Be this as it may, since this operation pain had begun in the eye and he constantly was worried with the feeling of a foreign body. The eye, previously quiet, became congested, the cornea very hazy, and on numerous occasions bullæ formed on it which were manifest at the time of the examination. Vision of the left eye at this time with suitable glasses was  $\frac{1}{8}$  —, the discovery pallid, and a beginning pathological cup was evident.

The right eye was enucleated on the 12th of September, 1902, by Dr. de Schweinitz, with immediate relief of pain and discomfort, and suitable glasses and a weak eserine solution were prescribed for the left eye. The visual field of this eye was uncontracted for form, but there was distinct limitation of the red field.

*Macroscopic Examination.*—On cutting the eyeball in a vertical plane passing through the cornea and optic nerve, a small foreign body was seen in the outer half of the eye imbedded in the retina and choroid, about 10 mm behind the ciliary body. On application of the magnet to this, small particles of rusted metal adhered to the point. The crystalline lens had disappeared, the iris showed a broad coloboma above, the retina was in place and thinned, and the optic nerve showed a shallow excavation. This half of the eyeball was mounted in glycerin jelly.

*Microscopic Examination.*—The other half was imbedded in celloidin, and the microscopic sections show the following lesions: The surface of the centre of the cornea is occupied by two bullæ, respectively 0.5 and 0.62 mm in diameter, situated in close proximity. Their walls are composed of epithelial cells alone, and, as is shown by the sketch (Fig. 2), a thickened layer of the epithelial cells forms the wall separating them. At this point Bowman's membrane is destroyed, so that the epithelial cells are attached to the substantia propria below the surface. There is a similar area of old ulceration above, in which Bowman's membrane has been destroyed and the corneal tissue replaced by scar tissue into which the thickened epithelium sends irregular processes. Elsewhere Bowman's membrane is intact, but is separated from the epithelium by numerous small spaces, filled with fluid and leucocytes and at the periphery by considerable pannus tissue. There is no connective tissue over its surface, as in the first case.

The walls of the bullæ are very thin, in places being composed of only two layers of cells. These cells show vacuolization



around the nuclei, and the basal cells are all squamous in type. Laterally from the bullæ the foot cells are separated by fine lines, and those of the superficial layers are swollen, and in many places have been lost or are being detached so that the surface is very irregular.

At the limbus the subconjunctival tissue is œdematous and the blood-vessels widely dilated, full of blood, and surrounded by a round-cell infiltrate. These capillaries extend a short distance into the corneal substance. The lamellæ of the substantia propria are very distorted and irregular and the corneal corpuscles stain poorly. The upper part of the cornea shows the position of the old iridectomy wound. Here Bowman's and Descemet's membranes are both interrupted, and the surface epithelium dips downward into the cornea.

The iris is well clear of the wound, but is adherent to the cornea at the periphery all around for a distance of one-half a millimetre anterior to the position of Schlemm's canal, so that the angle of the chamber is obliterated. The atrophic ciliary bodies are forced backward, and a beginning intercalary staphyloma is thus formed. The processes contain widely distended blood-vessels. The endothelial cells of Descemet's membrane are very irregular, as in Case 1, especially at the periphery of the cornea, where they are flattened, spaced apart, and allow stretches of Descemet's membrane to lie exposed.

The iris stroma is not much altered. There are a few mononuclear round cells in the tissue, and the surface is covered with a thin layer of organized fibrous tissue, which is still quite cellular. The cross-sections of two blood-vessels of considerable calibre, running horizontally, form conspicuous projections above its surface near the pupillary area. The ciliary muscle is very much atrophied, especially above, in the position of the coloboma. The pigment layers of both iris and ciliary processes are proliferated and show several large cysts, formed between the separating layers.

There is no trace of the crystalline lens, either of the cortical substance or of the capsule. The choroidal vessels are hyperæmic, but the choroid as a whole is thinned.

The retina is cystic anteriorly; posteriorly its ganglion cells have disappeared entirely. Mueller's fibres are hypertrophied and form rounded arches, where the individual bundles have been forced apart and cavities formed by collections of fluid. The rods and cones are irregularly curved in the same manner, and



show minute cavities. The retinal blood-vessels are full of blood corpuscles and exhibit thickened walls. The pigment epithelium is normal and the retina is not adherent to the choroid, being artificially detached above in the imbedding process. The nerve-head shows a shallow excavation, 0.4 mm deep, embracing the entire nerve. Both edges are overhanging and the nerve is atrophic.

The eyeball is enlarged in all its dimensions, and the sclera is thinned, especially in the equatorial region, but it shows no evidence of scleritis. Sections treated according to Perl's method show a slight staining of the cells of the ciliary region, but no decided iron reaction, such as is usually found after the presence of a particle of iron in the eye for so long a time.

*Diagnosis.*—*Foreign body in the interior of the eye ; iridocyclitis ; secondary glaucoma ; bullous keratitis with corneal ulceration ; iridectomy upward ; atrophy of the retina ; excavation and atrophy of the optic nerve ; beginning intercalary and scleral staphylomata ; blood-vessel formation on the surface of the iris.*

The two cases illustrate the two most frequent conditions of the eye in which bullous keratitis occurs, mainly, absolute glaucoma of the primary variety, and glaucoma secondary to an iridocyclitis, in this case traumatic in origin.

The subject of bulla formation on the cornea, as upon the skin in herpes and pemphigus, is still involved in considerable obscurity. The first case to be anatomically described was by Albrecht v. Graefe in 1853.<sup>1</sup> He found that the anterior wall of the bulla consisted of three layers—epithelium, Bowman's membrane, and a thin layer of superficial corneal substance. Schweigger,<sup>2</sup> however, and later Saemisch,<sup>3</sup> claimed that it consisted only of epithelium, and in the majority of cases this has been confirmed by other observers.

Fuchs was the first who was able to make sections of the entire eyeball on which bullæ were present, and reported his results before the Heidelberg Society in 1879.<sup>4</sup> He said that in two cases, in addition to the epithelium, the wall was formed by a layer of tissue composed of parallel and apparently homogeneous fibres, about  $\frac{1}{10}$  mm in thickness, apparently originating in the connective tissue accompanying newly formed blood-vessels which run from the periphery

toward the bullæ, between Bowman's membrane and the epithelium. He thought that Von Graefe had made the mistake of confusing this layer of connective tissue with Bowman's membrane, which it closely resembles, as he had been able to study only the wall of the bulla after its removal from the cornea. In a subsequent paper Fuchs<sup>6</sup> states that in some cases this layer of tissue is the result of the coagulation of an albuminous fluid forced through Bowman's membrane, just as a similar layer of coagulated fluid is often found on the posterior surface of the cornea. Such a tissue had been described by Leber,<sup>6</sup> Arlt,<sup>7</sup> and others, as a fine connective-tissue layer, differing from pannus in the greater absence of blood-vessels, and hence the lesser liability to absorption, from the surface of which fine twigs extended upward between the spaces in the epithelium. Brügger<sup>8</sup> and Birnbacher and Czermak<sup>9</sup> also mention this layer but do not say that it entered into the formation of the bulla.

In our first case, in which it is present, it does not extend to the bulla in the centre of the cornea, and so takes no part whatever in the formation of its wall, and apparently represents a continuation of the connective tissue from the corneal periphery. If this tissue is present at the site of the bulla it may of course form part of its wall, but it has been thus described only in exceptional cases, and the greatest interest, therefore, centres in the epithelium which is usually alone represented.

Thickening of the epithelial layers and a granular condition of many of the cells was noted by Graefe,<sup>1</sup> but it is to Leber<sup>6</sup> that we owe the most elaborate study of the subject. He described in detail the clefts between the cells, vacuoles surrounding their nuclei, the minute spaces between the epithelium and Bowman's membrane enlarging into tiny vacuoles filled with coagulated fluid, which were often in direct connection with the widened nerve canals passing through Bowman's membrane, and finally, the separation of the corneal lamellæ and the flattening of the corneal corpuscles. These appearances were fully confirmed by Fuchs,<sup>6</sup> and form a picture which since then has been recognized as typical of œdema of the cornea due to increased intraocular

tension. Very marked changes in the epithelium have also been sketched by Hess,<sup>10</sup> Nuel,<sup>11</sup> and Brügger.<sup>8</sup>

Nuel believes that many of the vesicles are produced by the local degeneration of the cells, especially of the middle layers, by the continued irritation of the epithelium. Brügger thinks that as a result of the lymph stasis there is an over-nutrition and consequent overgrowth of the cells, which, however, are not viable and soon degenerate, loosening their connection with Bowman's membrane. Birnbacher and Czermak,<sup>9</sup> on the other hand, believe that the degeneration is due to a neuritis of the corneal nerves—in other words, that it is an *akantholytic* process, such as is described by Lesser in herpes zoster and by Ausspitz in pemphigus. Panas<sup>12</sup> also thinks that by irritation of the corneal nerves, as in *zona*, the deeper cells may be liquefied and form the fluid contents of the bulla. The condition of the epithelial cells is therefore an important element in the production of these corneal bullæ, and while our two cases do not show the marked changes and bizarre forms described by Hess and Nuel, they illustrate a point which has not been sufficiently emphasized as a factor in the recurrence of the bullæ—*i. e.*, the change in the form of the basal cells. The corneal epithelium is much less firmly attached to the surface than the skin epithelium, because of the absence of the papillæ. In the normal eye the foot cells are cylindrical in form, and their basal plates fit smoothly to the surface of Bowman's membrane. Where the epithelium has been detached, however, the cells lose their cylindrical form and become small and irregular, and consequently are less firmly attached to Bowman's membrane and more easily raised by fluid forced through it. This factor must enter also in the recurrence of the lesion in the curious cases of relapsing traumatic keratitis bullosa, or traumatic keratalgia, some of which have been reported recently by de Schweinitz.<sup>13</sup>

The question as to the origin of the increased fluid in the cornea in œdema due to glaucoma has also been much disputed. Leber<sup>6</sup> believed that it was a pure stasis of the lymph circulation, and proved experimentally that fluid could not be forced into the cornea from the interior of the



eye by increased intraocular tension, as Descemet's membrane and its endothelial cells were impermeable. In this opinion he is upheld by Birnbacher and Czermak<sup>9</sup> and others. Birnbacher and Czermak believe that the increased fluid is to be ascribed to an increased transudation from the capillaries of the corneal limbus. Fuchs,<sup>8</sup> however, contended that, while under normal circumstances the endothelial cells are impermeable to fluids, under the pathological conditions which give rise to œdema of the cornea, changes in the cells, such as the loss of some of them, or in their form, whereby the interstitial spaces become broader, might render possible the passage of fluid from the anterior chamber into the cornea. Such changes, in fact, have been demonstrated by Panas<sup>12</sup> and are well shown in both of our cases, the cells being flattened and in places separated from each other by decided intervals. Greeff<sup>14</sup> thinks that in addition to this method there is a possibility that the fluid may come also from the capillary network of the corneal limbus. This increased fluid, which cannot be drained off laterally because of the obstruction of the lymph channels, forces its way through the widened nerve canals in Bowman's membrane, or, as Brügger believed, through parts of the membrane weakened by absorption, produces an interepithelial œdema which causes the cells to degenerate and loosen their hold on Bowman's membrane, and raises the epithelium in the form of bullæ. The irritation of the corneal nerves may also be a factor in causing degeneration of the epithelial cells, and when the bulla formation has once occurred, the weakening of the connection between Bowman's membrane and the cells by the substitution of flattened, squamous cells for the high cylindrical, basal cells makes the recurrence of the bullæ an easy one. After rupture of the vesicle, infection of the cornea may take place, and ulceration of the surface may be followed by panophthalmitis and total destruction of the eyeball.

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## A TEST FOR CENTRAL COLOR-PERCEPTION.<sup>1</sup>

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ETC.

*(With one text cut.)*

THE most commonly employed means of examining the macular color-sense and of testing for central scotoma—in fact the only one mentioned in most text-books of ophthalmology—is the perimetric method. To this particular purpose, however, the perimeter is not perfectly adapted, for in determining the limits of the visual field two factors are present which militate against accuracy in detecting small central or para-central defects. The first of these is the lack of control over the subject's fixation, and hence an inability on the part of the examiner to be sure that the macula alone has been concerned in the visual act. The patient is told to look at the mark on the centre of the revolving arc, but as the examiner is not in a line with the patient's gaze, a deviation of several degrees could take place without being noticed. Unless we have some means of compelling and insuring absolute fixation, we cannot with certainty detect, or, on the other hand, exclude beyond a doubt a small central color-scotoma. A further source of error lies in the fact that the test-object is brought in from a possibly quite normal periphery, so that the subject has learned the color of the target before it is presented for macular perception, and knows what he is expected to see.

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<sup>1</sup> Presented at the Section on Ophthalmology, New York Academy of Medicine, Monday, January 18, 1903.

Both objections may be removed if we keep the subject in ignorance of the color of the test-object until it is presented



FIG. I.

for inspection with the macula, and, using small targets, expose them to view for a moment only while the point at which they are to appear is firmly fixed. Recognition by normal eyes is virtually instantaneous, and before a color-defective macula can be moved by aiming the eye anew and bringing another portion of the retina into action, the target has disappeared. Absolute fixation is assured by standing opposite to the patient with one's own line of vision meeting his, and bringing the test-object up to a point where it is fixed by both subject and examiner. The slightest deviation of the eye of the former will at once be detected, and the target is not exposed until this is remedied. In practice the test is applied as follows: The test-objects are small, about 4 mm square, cut out of variously colored paper or cardboard. These are held in the palm of the left hand, hidden from the patient's view. With a small forceps, held between the thumb and third finger of the right hand, one of these color-squares is picked up and the index finger extended over

it so that it is still covered when the hand is held up before the patient, who is told to look sharply at the tip

of the index finger. When convinced that fixation is absolute the target is exposed momentarily by flexing the finger and sliding it down along the forceps, returning it immediately to the first position, hiding the test-object. The latter can thus only have been seen by the macula as it occupied exactly the same position as the finger-tip which was being sharply fixed and was covered before any correcting motion of the eye could be made. I desire now to present an instrument which embodies the same principle in a convenient and ready form. The color-carrier is much like an ophthalmoscope in general appearance, except that red, green, blue, yellow, and white color-discs take the place of lenses, and that there is, of course, no mirror. The front of the instrument (Fig. 1), which is to be presented to the patient, has an aperture 8 *mm* in diameter, which can be reduced by a sliding quadrant with openings 1, 2, 3, and 4 *mm* in diameter. The aperture is ordinarily covered by a shutter moving vertically in a spring-slide. The fixation point is marked by a white dot. Drawing down the slide uncovers the aperture, occupied by whichever color-disc has been rotated into position. When the slide is released, the shutter immediately springs back into its original position and again covers the aperture. The "exposure" may thus be made instantaneous, or if desired it may be indefinitely prolonged.

The color-carrier described above has, I believe, the merits of being ready, portable, accurate, and inexpensive. While claiming no originality for the test-method itself, my aim has been to increase its usefulness, and perhaps to call attention to its importance by putting it into a convenient instrument. The carrier is manufactured by E. B. Meyrowitz of this city, to whom I am indebted for the accompanying cut, and for the promptness and skill with which my suggestions were embodied in a practical form.



REPORT OF THE MEETINGS OF THE OPHTHAL-  
MOLOGICAL SOCIETY OF THE  
UNITED KINGDOM.

BY MR. C. DEVEREUX MARSHALL.

THURSDAY, JANUARY 29, 1903. W. LANG, F.R.C.S., PRESIDENT,  
IN THE CHAIR.

Messrs. A. STANFORD MORTON and J. HERBERT PARSONS read a paper upon **hyaline bodies** (Drusen-formation) **at the optic disc**, with drawings and notes of two cases and lantern slides.

Out of 42 cases in the literature 7 had retinitis pigmentosa, others were associated with injury, nervous disorders (from a simple headache to chronic hydrocephalus and insanity), and chronic interstitial nephritis, but a large number of patients were normal with normal vision. The condition usually commences in early life and is extremely chronic. In nearly all cases both eyes were affected, but often unequally. The prognosis is good. The pathological anatomy of the condition was discussed and various allied conditions demonstrated. It was shown that "Drusen" are not ordinary colloid bodies such as are found upon the choroid, though these too may occur near the disc. Exudates similar to the hyaline nodules may become metamorphosed into true bone such as is frequently seen in the choroid in shrunken globes. The fate of exudates in the disc and in other parts of the eye and their dependence upon environment were discussed.

Mr. J. HERBERT PARSONS read a paper upon **primary extradural tumors** of the optic nerve, with clinical and pathological notes of a case illustrated by lantern slides. There are 18 cases on record as compared with 102 cases of primary intradural cases.

The disease usually commences before the age of ten years and

the prominent symptom is exophthalmos, the protrusion being most marked in the axis of the orbit. The failure of vision is slow, slower than with intradural tumors, and is accompanied by optic neuritis of the "choked-disc" variety, to be followed by postneuritic atrophy. Later changes in the eye result from lagophthalmos. In no case was the globe invaded by the growth. Eight of the growths were undoubtedly endotheliomata, several having the characteristics of psammomata. The fibromatosis present in most cases is a feature of importance. The growths are slow and of relatively low malignancy, giving rise neither to glandular dissemination nor to metastasis. Considering this fact and that the point of danger is at the apex of the orbit, Krönlein's operation, with retention of the globe, is indicated wherever possible.

Dr. THOMAS SNOWBALL read a paper on the **formation of bone in the choroid**. Notes were given of a series of seven cases in which ossification had taken place in eyes that had become blind and shrunken as the result of old perforating injuries or long-standing inflammation with or without perforation. In the choroid a chronic inflammation with plastic exudation is set up, leading to degenerative changes in the various layers of this coat; the outer pigmented stroma becomes more or less fibrous, the inner layers, the chorio-capillaris and membrane of Bruch, are to a large extent replaced by fibrous tissue which has become organized from the exudation poured out towards the inner surface of the choroid. In this fibrous tissue, the bone has developed. At the areas of bone-formation, the chorio-capillaris when present is never a continuous layer, but is represented by only a few vessels here and there. The lamina vitrea, when seen near the focus of bone, was never found external to it. This is contrary to the observations of Brailey, Fontan, and others, who described cases where the membrane of Bruch was seen as a distinct line external to the plate of bone.

In most of his own cases the bone formed a layer in the usual situation, viz., around the optic-nerve entrance. In one case where colloid bodies were undergoing ossification, the bone in the choroid had evidently arisen independently of them and was in a more advanced stage of development.

In none of the cases was there a trace of sympathetic disease in the other eye.

From a study of his own cases and those described by Knapp,

Whiting, Lagrange, and many others, it was concluded that ossification in the choroid arises most commonly in fibrous tissue developing in the chorio-capillaris and either replacing it or lying immediately internal to it.

Mr. L. WERNER reported **two cases of tumor of the optic nerve, in one of which Krönlein's operation was performed with preservation of the eye.** He referred to another also under the care of Mr. Swanzy. The first was a woman aged forty-three. There had been a swelling of the inner canthus a year before she came under his observation. When seen the left eye was 2 cm in advance of the right and the eye was pushed downwards. The eye was blind, there was no pulsation or bruit, and the optic nerve was atrophied. A tumor of the optic nerve was diagnosed and it was removed by Krönlein's operation. It did not involve the eye in front, but behind it entered the apex of the orbit and required removing piecemeal. On account of the unsatisfactory condition of the cornea the lids were temporarily united, but they were subsequently opened again. The eye assumed its normal position, though with some impairment of movement. The tumor enclosed in the dural sheath was an alveolar sarcoma, the cells being rather suggestive of its being an endothelioma.

The second was a girl aged eleven, whose eye had for fourteen months been prominent and divergent. The eye was removed with the growth and the inner aspect of the lid was scraped and the orbit cleared out. This turned out to be a myxosarcoma surrounding the nerve, which was entirely degenerated.

Krönlein first performed this operation in 1899. It is not difficult to do and has many advantages over any other. The risks are practically nil and of seventy consecutive cases only one had died. In cases of orbital tumor in which the nerve was not involved the sight might be preserved.

The following card specimens were shown:

Mr. L. WERNER: Coloboma of the optic nerve.

Mr. F. A. C. TYRRELL: Congenital malformation of the lower lid.

Major M. T. YARR: Changes in the macular region following contusion of the eye.

Mr. E. T. COLLINS: Case of favus of the upper eyelid.

Mr. HOLMES SPICER: Sections from nævus of the orbit.

Mr. H. J. FISHER: Aneurysmal dilatations of the retinal vessels in a boy suffering from heart disease.



FRIDAY, MARCH 13, 1903. W. LANG, F.R.C.S., PRESIDENT, IN THE CHAIR.

Mr. STEPHEN MAYOU read a paper on the **treatment of trachoma by the X-rays**. The idea first occurred to him when treating rodent ulcer and lupus of the eyelid where he saw that no serious damage to the globe occurred. The first case cured in this way was shown by him last June, and since then several others have been successfully treated.

The histological changes in living tissues exposed to the X-rays were described, the most important being the superficial irritation capable of being increased and accelerated by the simultaneous application of the irritants, such as sulphate of copper; most of the resulting leucocytosis is formed around the trachoma nodules and the cells of rodent ulcer after the X-ray treatment, the reason for this being that they similarly act as irritants.

It was next pointed out that with care the amount of reaction could be regulated, and that the varying degrees of reaction might be compared with the first three degrees of burns described by Dupuytren.

Cases of prolonged exposure of the globe to the X-rays were then instanced where the only bad effects produced, and these only temporarily, were falling out of the eyelashes and conjunctivitis; this latter trouble was also found amongst workers in the X-rays, and in them could be prevented by the use of lead-glass spectacles.

In experiments on rabbits and frogs Mr. Mayou found, with Fuchs and Kriedl, that there was no bleaching of the visual purple.

The results of treatment with the X-rays were then compared with those produced by sulphate of copper, jequirity, etc., and it was pointed out that there were less destruction and subsequent cicatrization as well as far less pain with the former treatment.

The technique of the treatment was next described. The lids were everted, the operator's hands being protected with bismuth ointment and cotton gloves; the cornea was only exposed in severe cases where pannus was present. Owing to the infiltration set up difficulty was found in deciding when treatment should cease. Out of 9 cases 5 remained well; 1 cleared up but recurred two months later, 2 others improved and were still under treatment, and in one case of corneal opacity following trachoma the vision improved from P. L. to fingers at three feet.



The advantages of the treatment were: 1. There was less resultant deformity of the lids. 2. It was painless. 3. Pannus cleared more thoroughly. The disadvantages were: 1. All patients did not react to X-rays. 2. It was difficult to say when treatment should cease.

Lantern slides and patients were shown.

Remarks were made by the President, Mr. CARGILL, and Mr. STEPHENSON; the last said he had seen the best results from the use of the high frequency current.

#### **Anophthalmos and microphthalmos in a chick.**

MESSRS. TREACHER COLLINS and J. HERBERT PARSONS described the microscopical appearance of sections through the orbits of a chick, in which the right eye appeared to be congenitally absent and the left eye abnormally small. In the right orbit a ring of hyaline cartilage, like that of the sclerotic, was found enclosing partly pigmented tissue, similar to that of the choroid. There was no lens, retina, pigment epithelium, nor optic nerve—that is to say, there was a complete failure in development of all structures derived from neural epiblast.

The essential element of an eye is a nervous mechanism which serves to receive visual impressions for transmission to the brain. Where this mechanism is completely absent the condition may be accurately described as one of anophthalmos, notwithstanding the presence of some of the subsidiary structures developed from mesoblast.

So far as the writers have been able to ascertain, there is no case of congenital absence of the eye where it has been satisfactorily shown by microscopical examination that the mesoblastic structures were entirely absent.

On the left side the chick had a microphthalmic eye in which the lens had failed to become separated from the cornea. The capsule of the lens was adherent to the substantia propria of the cornea, Descemet's membrane having failed to develop. The adhesion had obstructed the growth of the iris forward; above, it had turned back and crept round the posterior surface of the lens; below, its growth had become arrested.

#### **Injuries to the eye of the child during labor.**

DRS. ERNEST THOMSON and LESLIE BUCHANAN communicated some of the clinical and pathological observations which they have made upon this subject. After indicating the scope of the work done in this connection, Dr. Ernest Thomson gave a résumé

of the lesions in the twelve cases observed. These comprised: expulsion of the eyeball, proptosis, injuries to the cornea, hemorrhages into various parts of the eye, and retroversion of the lens and vitreous body without rupture of the globe.

It was here pointed out that, owing to the limit of time, it was then proposed to devote special attention only to the most interesting points in the subject.

Dr. Leslie Buchanan then described in detail three cases of lesion of the cornea, namely: 1. Rupture of the posterior elastic lamina with involvement of corneal tissue (healing). 2. Rupture of the posterior elastic lamina and corneal tissue (unhealed). 3. Rupture of the posterior elastic lamina with abrasion. The points of similarity and difference were briefly explained. The identity of these cases of rupture of the posterior elastic lamina and corneal tissue with the cases already described as traumatic keratitis with linear opacity (*Trans. Ophth. Soc.*, vol. xxii.); from a clinical standpoint, was then pointed out, and the etiology of other corneal opacities seen at birth discussed.

Remark was made upon the very unusual injury, retroversion of the lens and vitreous body, and the nature and origin of the case somewhat fully explained. In conclusion the subject of traumatic exophthalmos was dealt with and allusion made to the connection between this and the localized indentation of the cranial bones due to pressure against the sacral promontory. The subject was illustrated by macroscopic and microscopic specimens and diagrams.

Mr. LAWFORD read notes of a case of complete dislocation of the eyeball forwards, occurring in a child aged seven, as the result of a fall against an iron fender.

Reduction was easily effected under chloroform, and recovery ensued with no defect of sight and no limitation of movements of the eyeball. Slight proptosis was noticeable for one month after the accident, but no restriction of ocular movements could be detected even three days after the reduction of the dislocation.

The following card specimens were shown:

1. Dr. LESLIE BUCHANAN: (a) Separation of the ciliary body.  
(b) Congenital mal-development of cornea and sclerotic.
2. Mr. STEPHEN MAYOU: Two drawings of normal fundi, illuminated by the mercury vapor lamp.
3. Mr. ARNOLD LAWSON: (a) Paralysis of cervical sympathetic.  
(b) Chronic irido-cyclitis, probably sympathetic.

4. Drs. W. E. THOMSON and LESLIE BUCHANAN: Preparations illustrating the effects of injuries to the eyes of a child during labor.
5. Mr. JESSOP: Tumor in macular region.
6. Messrs. SINCLAIR and PARSONS: Endothelioma of the cornea.
7. Mr. DOYNE: (a) Melanotic carcinoma of the upper lid.  
(b) Intraocular hemorrhage.
8. Mr. GOLDSMITH: Hole in macula.
9. Mr. HARMAN: Connective tissue veiling the disc.

REPORTS OF THE MEETINGS OF THE OPHTHALMOLOGICAL SECTION OF THE NEW YORK ACADEMY OF MEDICINE, HELD ON MONDAY EVENINGS, FEBRUARY 16 AND MARCH 16, 1903.

BY DR. HENRY H. TYSON, SECRETARY.

MEETING OF FEBRUARY 16TH. DR. A. DUANE, CHAIRMAN.

Dr. WEEKS read a **report** of an **extraction of cataract** from an eye **after sympathetic ophthalmia**. He gave the following history: C. S., aged twenty-nine years, was seen on January 27, 1903. At the age of twelve he was injured in the left eye by the explosion of a firecracker. The eye became very much inflamed and the vision was reduced to perception of light. Five years after the injury the vision of the right eye began to fail. The patient passed under the care of an oculist, who diagnosed sympathetic ophthalmia and who treated the case vigorously, but vision became reduced to perception of light. Six years after loss of vision in the sympathizing eye an iridectomy was performed in the hope of improving the vision, but without success. St. Pr.—Right eye: Ocular and palpebral conjunctiva normal. Cornea clear in its upper two thirds. Slight opacity at both margins of the cornea just below the horizontal meridian, measuring 2 mm in width and  $2\frac{1}{2}$  mm in length. Ribbon-shaped keratitis in the early stage of development. The anterior chamber is about two thirds the normal depth. The iris is atrophic and adherent to the capsule of the lens throughout about two thirds of its extent. Two or three radiating slits in the iris in addition to a small coloboma upward and outward. The pupillary area is occupied by a thickened mass of pseudo-membrane. The lens presented a yellowish-white appearance



and was of normal size. Perception of light good in all parts of the field of vision. Left eye: The conditions here were similar to those in the right eye, except that they are a little more pronounced. Vision equals perception of light, but the projection is faulty, particularly in the lower nasal portion of the field. As the eye had been quiet for some years and the projection was good, he told the patient that there was a possibility of improving his vision by removing the lens, which was done on the afternoon of January 27th, without loss of vitreous. Progress was favorable and without untoward symptoms until the third day after the operation, when a small hyphæma was present, the blood being bright red in color and apparently from the iris. Four days after the operation the patient was able to count his fingers at one or two feet. The coloboma was not at that time as large as it was immediately after the operation. Aside from a slight opacification of the posterior capsule of the lens, he saw no evidence of a formation of a cicatricial pupillary membrane. A faint reflex from the fundus ought to be obtained, but the vitreous humor did not appear to be perfectly transparent. Tension equals  $-\frac{1}{2}$ . Eye quiet.

Dr. VALK inquired whether in these cases a preliminary iridectomy would not be a better method, and if so, when would it be advisable to perform it. He referred to a case he had seen in which an unsuccessful attempt had been made to remove the lens.

Dr. WEEKS said that in these cases with atrophic iris adherent to the lens capsule and with cicatricial tissue in the pupillary area, it would be impossible to remove any iris without interfering with the lens capsule. The favorable sign in his case was a good perception of light in all parts of the field.

Dr. W. B. MARPLE presented a **case** (with report of others) in which he had done the **operation** suggested by Dr. E. Gruening for **primary divergent strabismus** (*Trans. Am. Oph. Soc.*, vol. vi., p. 165). The operation consists in a tenotomy of both externi (several millimetres back of the attachment of the tendons) followed by forced adduction of the eyes for twenty-four hours by an adducting suture, as pointed out by Dr. Gruening in this paper. The characteristics of the cases in which this operation is indicated are: 1st. Absolute and constant, not periodic or dynamic, divergence. It is absolutely unsuited to cases of secondary divergence. 2d. Good motility inwards. 3d. Often

associated with a high degree of myopic anisometropia, or unilateral amblyopia (he has seen it with normal vision in each eye).

"Both externi are operated upon at one sitting. In cases of divergence of not more than 2 mm the tendons are divided at their points of insertion. Whenever the deviation measures more than 2 mm the tendons are divided at a distance from their insertion corresponding to the degree of the squint. The conjunctival wounds are closed by a few interrupted sutures placed horizontally. A silk thread is passed through the conjunctiva over both interni muscles in a line with the horizontal meridian of the cornea and tied over a pledget of cotton on the bridge of the nose, which is left for twenty-four hours."

He has found that sutures introduced in this way were apt to pull the conjunctiva out through the palpebral fissure. In his cases he introduced them near the cornea at its temporal limbus and did not tie them quite so tight. He also excised the stump of the muscle. Simple myotomy without the forced adduction is not sufficient. In each of his cases after the double myotomy there was still divergence. There is apt to be considerable pain as long as the adducting suture is left in. This ceases as soon as this suture is removed. The cosmetic result is excellent, for the region of the caruncle is left undisturbed, which he thinks is a great advantage.

CASE.—Patient, girl, aged twelve; divergent strabismus (O D) of 5 mm; she had comp. myopic astigmatism in each eye. R and L vision equal to  $\frac{2}{100}$ ; with correction =  $\frac{2}{100}$  both. Divided both externi (August 12, 1902) 5 mm from insertion and excised stump. Closed conjunctival wounds. Then introduced silk thread over each externus close to cornea and tied over a pledget of gauze on the bridge of nose. Left in till next day. Patient discharged at end of week. Has perfect mobility in both directions. Absolutely no evidence of any remnant of squint. Converges readily to six inches. Two other cases—one a woman, aged thirty-two (right eye emmetropic, left 16 D myopia, with divergent strabismus in latter eye), and a man aged twenty-seven (similarly emmetropic or nearly so in his right eye, and with high myopia in left)—were operated upon in a similar manner and with equally satisfactory results.

Dr. GRUENING related a case in which vision was  $\frac{2}{100}$  in one eye and  $\frac{2}{200}$  in the other. Squint = 5 mm. He performed tenotomy 5 mm from insertion of tendon, and obtained a good result. This

operation was indicated for absolute divergence, and there should be good motility inward. A simple tenotomy and suture will cure a 2 mm divergence. If there is a divergence of 3 mm to 6 mm we should cut the muscle from 3 to 6 mm from its insertion. Sutures were important and were kept in for twenty-four hours, producing strong convergence.

Dr. WEEKS remarked that the operation was open to some objection. He thought that cutting muscles so far back affected the rotation of the eye outward without affecting the adducting power. It was necessary to increase the adduction by advancing the interni.

Dr. DUANE disagreed with Dr. Gruening as to the amount of squint corrected by a simple tenotomy. He thought more than 2 mm could be corrected by a simple tenotomy.

Dr. SCHAPRINGER presented a case of **typical round black spot at the posterior pole of a highly myopic eye**. There were atrophic choroidal patches with black pigment deposits, often seen in high myopic eyes, with a round black spot, with a light red ring around it. According to Emilie Lehmus (Horner, Zurich), the round black spot was supposed to be due to a hyperplasia of epithelium pigment. Fuchs has observed fifty cases.

Dr. TYSON inquired as to the amount of vision in the eye, as the spot, although located in the posterior polar region, did not embrace the macula.

Dr. SCHAPRINGER replied that he did not know the vision, as he had not recorded it.

Dr. DUANE referred to a similar case in which vision had been reduced from  $\frac{2}{40}$  to  $\frac{5}{200}$  in three months' time between examinations, during which time the black spot appeared at the macula.

Dr. SEABROOK said that he had seen a similar case, and had never heard of these round black spots becoming atrophic.

Dr. DUANE presented a case of **paralysis of convergence and divergence, with paralysis of the superior rectus** of ten years' standing. He gave the following history: Patient ten years ago, when she was thirteen years old, was suddenly attacked, while walking on the street, with diplopia both vertical and lateral. Examined then and right hyperphoria  $9^\circ$  was found. One year later, tenotomy of right superior rectus, reducing hyperphoria to  $4^\circ$ , then tenotomy of the left inferior rectus, producing marked over-correction. This it was attempted to remedy by tenotomy of the left superior rectus, and subsequently a number of operations



were done. Had also exercised with prisms, and she has worn prisms and various glasses (convex, sphero-cylinders) designed to correct the refraction.

When he first saw her, ten months ago, she had diplopia in every direction of the field of fixation and marked vertigo, with the objective evidences of marked but not complete paralysis of the left superior rectus and a less marked paresis (evidently post-operative) of the right superior and the left inferior recti. Nearly complete paralysis of convergence and divergence, as shown by the following signs: approximate balance for distance (exophoria or crossed diplopia of only one or two degrees); insuperable crossed diplopia beginning at six feet from the eyes and increasing steadily in amount as the object of fixation was carried nearer the eyes; inability to overcome prisms of even one degree either base in or base out; inability to converge even to the slightest degree on a test object carried toward the eyes; absence of pupillary convergence-reaction with retained light-reaction; all this being combined with a perfectly normal excursion of either eye, inward or outward, in performing associated parallel movements. The most annoying symptom being the vertical diplopia in looking down, due to the post-operative insufficiency of the left inferior rectus, he did a carefully graduated tenotomy of the right inferior rectus. This operation, he said, although not the logical one to do under the circumstances, equalized fairly well the difference of level of the images in the lower field. Then during several months systematic efforts were made to develop the converging power by prism exercises and in other ways. A temporary moderate improvement was secured, the patient at one time being able to overcome a five-degree prism, base in, and by extreme effort a prism of nine degrees, base out, and once was able to converge to ten inches. Such momentary restoration of the converging power was always associated with restoration of the convergence-reaction of the pupil. The temporary improvement and convergence were not maintained, and five months ago he did an advancement of the left internus. The immediate result, which was also the permanent result of this operation, was to produce for distance an insuperable homonymous diplopia of ten degrees, which, as the test object was carried toward the eye, steadily diminished, until at seventeen inches from the eye there was single vision, and this at fifteen inches from the eye was replaced by a crossed diplopia that increased steadily as the object



was brought still closer—*i. e.*, all that the operation did was to shift the point of equilibrium from far distance to a point sixteen inches from the eyes. She could not converge the eyes to any point within this distance nor diverge them to any point beyond. Such a condition, although giving her troublesome diplopia on the street, was yet advantageous in that she was enabled to do her work at a typewriter without confusion. Two and one half months ago the right hyperphoria, which had already begun to show a slight increase, suddenly amounted to fifteen or sixteen degrees. This was found to be due to an increase in the paralysis of the left superior rectus, which had now become almost total. Diplopia characteristics,—*i. e.*, vertical diplopia was very marked ( $35^{\circ}$ – $40^{\circ}$ ) in looking up and to the left, was as marked ( $18^{\circ}$ – $20^{\circ}$ ) in looking to the left on the horizontal plane as in looking straight up, while in looking up and to the right it was only four or five degrees. Examination by a neurologist has failed to show any evidence of organic nervous disease. Here the condition originally present was surely a paresis of the left superior rectus, the insufficiencies found in the other vertical muscles being evidently due to operation. Ten years after it first developed, this primary paresis suddenly and without cause increased and became total. The other pathological condition obtaining was a paralysis of convergence and divergence, which, although varying, was nearly complete. He stated that the facts illustrated by this case were as follows: 1st. The unwisdom of attempting to correct a deviation (especially a hyperphoria) due to a paresis of one muscle by a tenotomy of its antagonist. The result is nearly always disastrous. Here with an initial insufficiency of the left superior rectus causing a right hyperphoria, tenotomy of the right superior rectus was proper under the circumstances, but to supplement this by a tenotomy of the left inferior rectus was a serious error. 2d. The care that has to be exercised in handling these paretic affections, which after remaining stationary, it may be for years, suddenly and without cause increase or diminish. 3d. In paralysis of an elevator, the increase of a diplopia in looking to the right or left is fully as great as the increase in looking straight up, and is of more significance for the diagnosis. 4th. The contraction of the pupil taking place when the attention is directed to a near object is a convergence-reaction and not an accommodation-reaction. In this, as in similar cases, it was only when the patient converged, not simply when she accommodated, that the pupil contracted.

5th. The correction of a complete convergence-paralysis by operation is unsatisfactory, about as much so indeed as the correction of a complete paralysis of a muscle by advancement of it. All that the operation accomplished in this case was simply to shift mechanically the point of equilibrium from twenty feet down to sixteen inches. The converging power was not increased at all.

Dr. VALK was of the opinion that cases of paralysis of convergence were due to affections of central origin and that operations were inadvisable. He considered internal medication advisable.

Dr. DUANE **showed drawings of the fundus in a case of aplasia of the optic nerves, with colobomata of the retina at each macula.** (Will be published in the next number with drawings and full review of the incident literature.—H. K.)

Dr. ARNOLD KNAPP **presented a specimen of hydrops of the optic-nerve sheath.** He said the specimen belonged to the case of a man forty years old who suffered from a tumor of the cerebellum. In the beginning of October, 1902, vertigo and ataxia set in; later headache and vomiting. Right pupil dilated, optic neuritis more pronounced right than left. He died December 6th. At autopsy, marked flattening of the convolutions. Ventricles distended. A tumor measuring  $1 \times \frac{3}{4}$  inch with a central cyst occupying the anterior margin of the worm and the right superior peduncle. Microscopically the growth was a glioma. On removing the roof of the orbit the typical ampulliform dilatation of the nerve sheath was present. Microscopic sections of the optic nerve and papilla revealed a distension of the subarachnoid space, an œdema of the optic nerve and especially of the papilla, a moderate venous stasis, but no inflammatory products. The case can therefore be regarded as a pure choked disc. The pathology of the optic-nerve changes occurring in intracranial troubles is not completely cleared up. The distinction between choked disc and optic neuritis has in recent years no longer been upheld, some claiming that the changes in all cases are more or less inflammatory in nature, while others have found no signs of inflammation in optic neuritis. The changes in this case seem to be secondary to stasis from increased intracranial pressure. It is well known that tumors in the posterior cranial fossa, even if small, are most apt to cause ophthalmoscopic changes. These must act as in the case just described by exerting direct pressure on the fourth ventricle and the Sylvian aqueduct, producing an internal hydrocephalus.

MEETING OF MARCH 16TH. DR. A. DUANE, CHAIRMAN.

The evening was devoted to a conference on lachrymal disease.

Dr. TAYLOR presented a case of **lachrymal disease in which he relieved the condition by the removal of the whole inferior turbinate and subsequent probing without slitting the canaliculus.**

Dr. BORN spoke about the **expectant treatment of lachrymal disease, indications, contra-indications, and results.** He said that if phlegmon of the sac could not be prevented in the earliest stage by frequent pressing out of the sac and injection of antiseptic solutions, it was best to hasten the formation of the abscess by moist warm compresses. As soon as the presence of pus becomes apparent by fluctuation, a free incision should be made into the anterior wall of the sac, the contents pressed out, and the moist warm compresses continued. Daily cleansing of the sac by syringing and a subsequent injection of a 1 % solution of nitrate of silver into the sac would shorten the course of healing. During this stage of the inflammation, the mucous membrane is swollen, its blood-vessels are engorged, and the folds at the entrance of and in the duct are enlarged. Passing probes without lacerating the tissue would be difficult and traumatic strictures may be the result. He prefers to let the inflammation subside, and after the opening has closed, proceed with the local treatment of the catarrhal inflammation. When the abscess has opened upon the outer wall of the sac and the pus has undermined the skin and produced a fistula upon the cheek, the entire length of the sac is opened and the granulating surface freely cauterized with the nitrate-of-silver crayon.

The treatment of chronic catarrhal inflammation of the sac must first be directed against the cause of the disease in the nose. Obstructions should be removed and inflammation be treated. A large number of cases will yield to persistent local treatment of the conjunctiva and lachrymal sac. The contents of the sac are frequently emptied and astringent eye-washes, solutions of sulphate of zinc, tannic acid, alum, or nitrate of silver instilled two or three times a day or once or twice a week; nitrate-of-silver solution 1 % is injected directly into the sac through the punctum, without slitting the canaliculus, by means of a small lachrymal syringe. Heat applied over the sac several times a day and massage over the sac help to establish a good reaction. If this treatment is



faithfully carried out for several weeks, in some cases for a few months, the dacryocystitis will in very many cases be permanently cured without epiphora, which is frequently observed after the slitting of the canaliculi, whenever there is a hypersecretion of tears.

The function of the tear passages is not simply that of a drainage pipe, but they act as a suction pump. The canaliculi are surrounded by spiral muscular fibres from Horner's muscle, by which they are compressed in winking. The act of winking is an important factor in removing the hypersecretion of tear fluid. Ordinarily the tear glands secrete only sufficient quantity of fluid to keep the conjunctiva, cornea, and tear passages moistened, and only when the eye is irritated or inflamed or upon psychical stimulation a greater supply of tears is furnished, which will run over the cheeks unless removed into the lachrymal passages by frequent winking. The spiral muscles cause a vacuum at the orifices of the canaliculi, into which the tears are drawn when the lids are opened, and they press the contents into the sac when the lids are closed. The elasticity of the walls of the sac may then facilitate the descent of the fluid into the nasal duct. Before resorting to operative treatment we should make at least a reasonable effort to preserve this valuable apparatus. A good result may be expected from astringent treatment as long as the contents of the sac can be freely evacuated into the nose. When local treatment has failed to give relief, the canaliculus is slit and probes are introduced. The upper canaliculus is selected, even though its calibre is smaller, since the lower is more effective in carrying the tears into the sac. In cases of mucocoele, total closure of the duct, chronic dacryocystic blennorrhœa with thickening and degeneration of the walls, and in chronic catarrhal inflammation with recurring phlegmonous attacks the sac should be removed. Extirpation of the sac is permissible even in mild cases of catarrhal inflammation, whenever an operation has to be performed on the eyeballs, for instance, before the removal of cataract. In moderate eversion of the lower puncta, the result of irritation and contraction of the lids in long-continued epiphora, partial slitting of the canaliculi with the opening on the conjunctival surface of the canal is generally recommended. He prefers to remove a triangular piece of eyelid at the outer canthus, shortening the lids sufficiently to raise the puncta and bring them in apposition with the eyeball.



DRS. HUNTER and LEWIS confined their remarks principally to the **treatment with probes, giving indications, technique, duration of treatment, and outlook for a permanent cure.**

Dr. HUNTER stated that probing was indicated in all the milder cases of catarrh of the sac which do not respond after a reasonable time to the expectant treatment, and in all the severe cases, including phlegmonous dacryocystitis. In the latter class, preliminary treatment by hot fomentation and free external incision should be employed, probes being resorted to after subsidence of pain and swelling. Technique: slitting of canaliculus on conjunctival surface of lid, lateral incision of lachrymal sac, if necessary followed by probing, using as large probes as the bony canal will permit without undue violence, *i. e.*, from No. 6 or 8 to No. 16—Weber probe used first, immediately after incision. Syringing, always before probing, with cleansing solution and astringents, varying in strength from a normal salt solution to a 2 % arg. nitrat. sol. or 25 % argyrol. Duration of treatment: from a month to a lifetime. Styles are sometimes used in the obstinate cases, but, as a rule, only when patient lives at a distance or for some reason cannot be seen often. The most obstinate cases are often only the local manifestation of deeper-seated trouble in ethmoid, or frontal sinus, etc. Outlook for a permanent cure: most of the cases made quite comfortable, but very many are disappointing as regards perfect cure by any method of treatment. He considered that treatment by probes, however, was the most satisfactory method in his hands.

Dr. LEWIS thought that in simple epiphora probes should not be used until other treatment, such as astringents, had failed; that probes should not be used after ophthalmia neonatorum, and never unless the canaliculus was opened. He said that treatment of the nasal membranes often cures. As a technique he advised a free opening backwards and free cut at junction of canaliculus and sac. Probes 6-12 used. Syringed freely with borax solution. Duration: He said chronic cases with simple lachrymal or mucoid secretion do not respond to treatment as quickly as acute dacryocystitis with purulent secretion. Cases of long duration do heal under probing and syringing. Most cases were stricture cases either from swelling of lining membrane or were cicatricial. Hence the chief point in treatment was through drainage.

Dr. CUTLER referred to **cases of delayed opening of the**

**naso-lachrymal septum in the new-born, with consequent dacryocystitis.** He was of the opinion that dacryocystitis in the new-born was a matter of frequent occurrence and should receive more attention than has been given it. He referred to that disturbance of the lachrymal sac occurring in healthy children, where no constitutional or nasal complications existed except the retention of the partition between the nose and the sac, which leads to an accumulation of the contents of the sac and often to secondary infection. Many of these cases, probably the great majority, are relieved by spontaneous opening of the occluding membrane and are not seen by the oculist. Others are treated for days or weeks by the general practitioner and finally reach the specialist. In these cases, when the condition is simply one of retention, the conjunctiva is hyperæmic, not secreting profusely, and, as a rule, smooth, not the picture of a conjunctivitis. If the condition shows signs of secondary infection of the tear sac, then conjunctivitis is apparent. The puncta are usually patent and on pressure emit a gelatinous or muco-purulent fluid. After a slight nick of the canaliculus, Bowman 3 or 4 passes easily to the floor of the nasal duct. In these cases strictures do not exist. Fluid forced in will often at first not pass to the nose, but regurgitates along the canula; but, after a little manipulation sometimes gently tilting the canula to one side, or after a few days' delay, the use of a 1% silver solution and renewed irrigation have overcome the obstruction, and a sudden gush of mucus from the nostril indicates the end of the process. It has seemed best finally to take these simple measures in ten cases he has been able to observe with care; in some of the cases, after waiting for several weeks or longer with expectant treatment only, such as gentle massage and astringent collyria. In these cases it is quite probable that the membrane at the lower end of the lachrymal sac would have perforated in time, if nothing had been done, but in the meantime the eye was exposed to the profuse secretion, containing organisms capable of starting a serious infection if the cornea had been abraded. Moreover, the infants' nutrition seemed to have been affected to some extent, at least they were less restless and took their food better after a normal condition was reached. Several cases came under observation during the spring or early summer months, when it was necessary for the family to leave the city, and a speedy termination of the difficulty was most desirable. It may also be

suggested that to ignore such a condition, producing constant irritation and congestion and lasting weeks or months, in the belief that nature will restore the parts unaided, is to sow the seeds of more serious trouble in later life. On the other hand, the risk to the child is very slight, if a small Bowman probe is used, and reliance placed chiefly on irrigation with a canula long enough to reach nearly to the lower end of the sac, so that a current of fluid is forced against the obstruction. It is probable that the membrane is not always in a direct line with the axis of the canal, so that irrigation is more effectual as well as more gentle than the deep introduction of the probe. It is important to use a canula the edges of which are not sharp as are most of those in use. The trifling enlargement of the punctum and canaliculus leaves no later impairment of function. These cases, described by Dr. Kip in 1879, Peters in 1891, and Rochon-Duvigneaud in 1899, have added to our knowledge of the subject.

Dr. A. KNAPP described the **radical treatment by extirpation of the lachrymal sac, giving indications and technique.** (Will appear in full in the next number, ARCHIVES OF OPHTHAL.)

*Discussion.*—Dr. H. KNAPP said that the epiphora from eversion of the puncta could in most cases be cured by brushing a 1% solution of nitrate of silver over the swollen edge of the lower lid and adjacent conjunctiva once a day or every other day for several months. The mucous membrane thus treated cicatrizes, shrinks, and the everted punctum is drawn toward the eyeball.

As to the discharging of puriform matter coming from the lachrymal sac of babies, which had been touched upon by Dr. Lewis, he would say that this was not very rare and would probably have oftener been brought to our notice, did it not spontaneously disappear in the course of weeks or a few months. We should not forget that the lachrymal sac is one of the accessory cavities of the nose, and it is not far-fetched to surmise that at birth it may be more or less filled with muco-pus, as the tympanic cavities invariably are. I, at least, have in all my long career advised parents that brought such children to my consultation room to leave off all fear together with all harsh treatment. Keeping the eyes clean and pressing the region of the sac with a pledget of absorbent cotton was all that was necessary to cure the trouble.

Dr. H. Knapp spoke also of the poor satisfaction of the treatment of epiphora from chronic stricture of the lachrymal duct, by



slitting the canaliculi and probing, but he spoke acknowledgingly of the good results of extirpation or obliteration of the sac in chronic suppuration. In obliteration, by a broad opening and scraping the inner wall with sharp spoons, or destroying the granulations with nitrate of silver, even the lachrymal canal might be restored.

Dr. GRUENING considered extirpation of the sac indicated whenever lachrymal disease is present with cataract, before performing cataract extraction.

Dr. WEEKS thought that in congenital cases condition will clear up with mild treatment if time is given. He had one unfavorable result from probing in these cases, while he had several improve after probing. In cases where he uses a probe he slits the canaliculus, after which they require probing for a time to prevent union of the walls. In epiphora he found syringing unsatisfactory. Probing proved more satisfactory than syringing alone. In cases where probing has not relieved, he has used lead or gold styles, preferring them to silver, which becomes encrusted. Does not advise extirpation of sac for chronic dacryocystitis, dilatation of sac, or fistula.



SYSTEMATIC REPORT ON THE PROGRESS OF  
OPHTHALMOLOGY IN THE SECOND AND  
THIRD QUARTERS OF THE YEAR 1902.

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PINTO, Lisbon ; Dr. HEINRICH  
SCHULZ ; and others.

Translated by Dr. WARD A. HOLDEN.

Sections IV.-VII. Reviewed by DR. G. ABELSDORFF, Berlin.

IV.—ANATOMY.

243. **Naito.** A contribution to the knowledge of the intrascleral nerve loops. *Klin. Monatsbl. f. Augenheilk.*, xl., 11, p. 122.

244. **Sagaguchi.** On the relations of the elastic elements of the choroid to the optic-nerve entrance. *Ibid.*, p. 126.

245. **De Lieto Vollaro.** The arrangement of elastic tissue in the sclero-corneal trabeculae, and the relation of the latter to the sclera, the tendon of the ciliary muscle, and the membrane of Descemet. *Arch. d'opht.*, xxii., 5, p. 311.

246. **Smirnoff.** The sclera as a location of sensory nerve terminations. *Neurolog. Wjstn.*, ix., 1 (after an abstract in the *Wratschobnaja Gaz.*, 1902, No. 24).

247. **Herzog.** On the development of the intrinsic muscles of the eye. *Arch. f. mikros. Anatomie u. Entwicklungsgeschichte*, lx., p. 517.

NAITO (243), examining serial sections of a phthisical eye, confirmed Axenfeld's statement that the picture of ciliary nerves

passing transversely through the sclera is brought about by the ciliary nerve passing forward, then entering the sclera and bending back in a loop to enter the suprachoroidea and again extend forward.

SAGAGUCHI (244) has used not only the orcein method but also the Weigert stain for demonstrating the elastic elements of the choroid. A direct continuation of the fibres of the lamina vitrea into the optic nerve could not be made out, but the network of fine elastic fibres lying on the outer surface of the lamina vitrea interlaces with the marginal tissue and enters the optic nerve. The other elastic tissues of the choroid interlace so with the marginal tissues that they cannot be followed uninterruptedly into the optic nerve. Besides the larger scleral portion, choroidal fibres also may be readily seen to enter the optic nerve.

DE LIETO VOLLARO (245) studied the elastic fibres in the sclero-corneal meshwork between the sclera and tendon of the ciliary muscles on one side and the cornea with Descemet's membrane on the other, which separates the anterior chamber from Schlemm's canal. He found in the sclera, in the region of the tendon of the ciliary muscles, numerous elastic ring fibres. These elastic fibres ran in various directions and, forming a fine grill-work, extended to the chamber angle and the root of the iris. The meshwork of elastic fibres continues from the sclera into the deeper layers of the cornea.

All elastic fibres possess a connective-tissue sheath arising from the connective tissue and containing endothelium. The endothelium passes over upon Descemet's membrane, which begins abruptly and has no relation to the elastic tissue.

V. MITTELSTÄDT.

SMIRNOFF's (246) histological studies of the sclera in man, the rabbit, and the dog show that, besides the nerve-endings in the vessel wall, there are other free nerve-endings in the bundles of fibres producing the cement substance. Thus the sclera is not only a mechanical apparatus and a means of passage for the nerves and vessels to the deeper portions of the eye, but also a sensory capsule of the ball.

HIRSCHMANN.

#### V.—PHYSIOLOGY.

248. **Hess.** Further investigations on total color-blindness. *Zeitschr. f. Psychol. u. Physiol. d. Sinnesorgane*, xxix., p. 183.

249. **Broca.** On the perception of colored signals and tests for color perception. *Ann. d'ocul.*, cxxviii., p. 265.
250. **Himstedt and Nagel.** Experiments on the excitation produced by various sorts of rays on the eyes of man and animals. *Festschr. d. Univ. Freiburg z. 50 jähr. Regierungsjubiläum S. K. H. d. Grossherzog Friedrich v. Baden*, 1902, p. 259.
251. **Lodato and Pirrone.** On the association paths between the two retinas. *Arch. di Ottalm.*, ix., 9, 10.
252. **Schenk and Just.** On intermittent excitation of the retina. *Pflueger's Arch. d. Physiol.*, xc., p. 270.
253. **Grützner.** Some experiments on stereoscopic vision. *Ibid.* (Not adapted for an abstract.)
254. **Tschermak, A.** Studies on the binocular vision of the vertebrates. Preliminary contribution. *Pflueger's Arch. f. Physiol.*, xc., p. 270.
255. **v. Várady.** Investigations on the oculo-pupillary sensory reflex. *Wiener klin. Wochenschr.*, No. 12, p. 310.
256. **Stewart, G. N.** A remark on dilatation of the pupil from excitation of the cerebral cortex. *Centralbl. f. Physiol.*, No. 21, 1902. (The dilatation follows excitation of a point near the sulcus cruciatus.)
257. **Ruge.** On the centre of the pupillary reflex and the pupillary reflex arc. *Graef's Archiv*, liv., p. 483.
258. **Colombo.** A new experimental contribution to the study of the relations between the visual angle and the light. *Buletino della Scienze Med.*, Bologna, lxxii., ii., fasc. 4.
259. **Crzellitzer.** On the visibility of the Roentgen rays. *Fortschr. a. d. Geb. d. Roentgenstrahlen*, v. 4, p. 245.
260. **Verhoeff.** A theory of binocular perception and some remarks upon torsion of the eyes, the theory of vicarious fovea, and the relation of convergence to the perception of relief and distance. *Annals of Ophth.*, April, 1902.

HIMSTEDT and NAGEL (250) have studied the action of various homogeneous rays on animals' eyes by means of the so-called retina-action currents, and find by this method that the eyes of frogs and owls which have been kept in the dark are sensitive to the Roentgen rays. In the hen's eye, which is free from rods, neither a weak illumination nor the Roentgen rays produced an electromotor reaction, and this was brought about only by intense illumination. In this respect the authors see an indication of the rods as a dark apparatus, which is wanting in the hen's eye.

The visibility of the ultra-violet, Becquerel, and Roentgen rays is chiefly referred to fluorescence, the last-named rays causing fluorescence in the retina alone, the two others in the other refractive media also. The view of Parinaud, that perception of the ultra-violet depends upon fluorescence of the visual purple, is rendered improbable, since analogous to Kühne's observation that fluorescence is more marked in the bleached retina than in the



unbleached, the sensitiveness for ultra-violet is increased by adaptation for dark—*i. e.*, in an eye rich in purple.

At the close of the paper the authors report a very interesting experiment in regard to the power of distinguishing colors possessed by animals. A poodle will learn to fetch a red-colored object from among similar objects of different colors when the word "red" is said; and since the experiment is successful when colors of different luminosity are used, the existence of actual color discrimination cannot be denied.

LODATO and PIRRONE (251) carried out experiments on the condition of the retina of one eye of a frog long kept dark when the other eye had been exposed half an hour to direct sunlight. The experiments were made with:

1. Normal animals.
2. After removal of the cerebral cortex.
3. After destruction of all communication between the retina and the centre, leaving the chiasm untouched.
4. After division of both optic nerves.

The results were:

1. In both eyes contraction of the rods and cones and migration of pigment.
2. In both eyes contraction of the retinal elements over an equal area but of less degree in the resting eye.
3. In the resting eye the emigration of pigment does not reach the limitans externus as in the eye exposed to light, and is more marked in the nasal than in the temporal periphery. This difference is constant and when the illumination has been weak a movement of the pigment granules can be found only in the nasal periphery.
4. Changes are observed in the illuminated eye alone even when only a single nerve is divided. KRAHNSTÖVER.

SCHENK and JUST (252) in this tenth report come to the following conclusions from experiments with rotating discs: When a sector of the disc composed of black and white elements and another of an equivalent gray act on the retina alternately, the time required to blend the black-white group is smaller the longer the duration of the gray in comparison with the duration of the other. When the retina is excited alternately with a number of succeeding black-white groups and with a number of equivalent grays, the increase in the number of the black-white groups and the duration of the action of the gray acts unfavorably on the blending of the light perceptions.



TSCHERMAK (254) has proposed an objective method of determining the location and extent of the binocular field of vision in the vertebrates. He observes the inverted retinal image of a light after the posterior portion of the eye has been exposed, and he brings the light nearer until an image can just be seen in either eye. The lateral extent of the binocular field is measured by moving the light in an arc. He found that in all the vertebrates examined even when there was total decussation of the nerves, as in the hen and dove, a binocular field exists. Naturally the field is limited in animals with marked divergence of the ocular axes, and the middle point of the binocular area does not lie near the optic axis as does the fovea in man. The paper concludes with hypotheses in regard to the correspondence and the associated action of the binocular retinal area in the vertebrates.

VÁRADY'S (255) investigations were in regard to the phenomenon described by Stefani and Nordera, viz., that after a sensory excitation mydriasis comes on followed by myosis, and if the excitation continues mydriasis comes on again and is again followed by myosis. Várady finds that the most practical method is to stick a needle into the skin near the eye, and then observe the reflex phase which begins with dilatation and ends with contraction of the pupil. The degree of the reflex differed in different persons, while the reflex was wanting in many healthy persons and in cases of functional disturbances of sensibility—*e. g.*, hysterical anæsthesia or hyperæsthesia might either be present or absent, showing that the production of the reflex excluded with certainty the presence of an organic anæsthesia.

RUGE'S (257) experiments on decapitated heads of rabbits and cats, even after complete division of the medulla oblongata, revealed perceptible pupillary reaction, and thus failed to substantiate Bach's idea of the spinal location of the centre for the pupillary reflex. So much for the facts. Ruge adds the hypothesis that in reflex iridoplegia an affection exists of the root of the sympathetic in the cervical portion of the cord, and since the motor excitation in the ciliary ganglion is carried to cells of the sympathetic system, the ciliary nerves thus lose their power of conduction—that is, an interruption is brought about in the pupillary reflex arc.

COLOMBO (258), after numerous investigations of the acuteness of vision of one eye when adapted for strong and very weak lights, comes to the following conclusions:

1. The eye attains its highest acuteness of vision with an illumination—less and often considerably less—than one normal candle.

2. Of two eyes examined under physiological conditions, that with the better acuteness of vision reaches its most perfect vision in the least illumination in which perfect vision is still attainable.

The original paper must be consulted for an accurate account of the methods of investigation and the various conditions, as to illumination, test types, and the like, under which the experiments were made.

KRAHNSTÖVER.

CRZELLITZER'S (259) experiments show that the Roentgen rays are visible to the dark adapted eye. The conflicting reports of other observers are to be explained by the fact that only hard tubes are proper for eliciting the phenomena, which are seen in the form of a diffuse bright disc or of a pale light ring with a paler included field. Although in the experiments the right half of the retina was acted upon more intensely than the left, there was no difference in the perception between the right and left halves, in which the writer sees a proof for the inconsiderable absorption of the rays by the sclera and retina.

"Since the brightest spot does not lie in the middle of the field of vision, the region of the macula can possess no particular sensibility for the Roentgen rays as it does in ordinary vision." As we know, the macula is not the point of most acute vision for weak light when the eye is in a condition of dark adaptation—an analogy not mentioned by the writer.

When the Roentgen rays are allowed to pass along the cheek, the equatorial portion of the retina proves to be particularly excitable. The author leaves the question open whether the greater sensibility is due to the percipient elements of this region or is simulated on account of the lack of bone shadow here.

VERHOEFF (260) offers to explain binocular vision on the theory that there are three cortical centres, one for each eye, which can be used independently, and a third for binocular perception. The latter centre would be regarded as representing the so-called cyclopean eye. Anatomical localization is of course impossible. An image is produced by the impulses passing from the two uniocular systems and acting jointly upon the cyclopean centre. Under ordinary conditions the uniocular images are inhibited, although according to the theory every object not lying upon the horopter is represented in the brain by three images—two

uniocular and one binocular. The author demonstrates the possibility of seeing these three images under favorable conditions.

ALLING.

#### VI.—REFRACTION AND ACCOMMODATION.

261. **Schmidtlein.** A contribution to the subject of myopia of high degree. *Inaug. Dissert.*, Tübingen, 1902.

262. **Helmbrecht.** A statistical contribution to the subject of hyperopia. *Ibid.*

263. **Guttman.** A statistical contribution to the etiology of myopia of high degree. *Graefe's Archiv*, liv., p. 268.

264. **Voigt.** On the operative treatment of high myopia by means of extraction of the transparent lens and its results. *Ibid.*, p. 227.

265. **Chevallereau.** On the total correction of myopia. *Ann. d'ocul.*, cxxviii., p. 186.

266. **Sulzer.** Rapidly developing myopia probably of syphilitic origin. *Bull. d. l. soc. d'ophth. de Paris*, June 3, 1902.

267. **Römer and Dufour.** Experimental and critical investigations on the question as to the influence of the sympathetic on the accommodative process. *Graefe's Archiv*, liv., p. 491.

268. **Fromaget.** Ocular spasm of 9 dioptries in a hyperope of twenty. *Bull. d. l. soc. de méd. et de chirurg. de Bordeaux*, Feb. 21, 1902.

269. **Weidlich.** The optical significance of the accommodative play of the pupil. *Arch. f. Augenheilk.*, xlv., p. 119.

SCHMIDTLEIN'S (261) statistics of 419 myopes of 10. D or more, observed in the Tübingen clinic, showed that females were more frequently myopic than males and that the average acuteness of vision decreases with the increase of myopia. In a great number of cases close work was not a factor, nor did heredity play an important rôle. As complications, affections of the macula were found in 43.6 % and detachment of the retina in 3.9 %.

HELMBRECHT (262) collected 1000 hyperopes from the Tübingen clinic with 1455 eyes free from complications and available for visual tests. The highest degree observed was 15. D in a patient with pure microphthalmus. From the tables it appears that there is a gradual decrease in acuteness of vision with advanced degrees of hyperopia, the average vision in persons with + 1. being 0.96; with + 4. D, 0.89; and then there is progressive sinking of vision in the higher degree up to 0.11 with 15. D.

GUTTMANN (263) has studied the etiology of myopia with reference to occupation in Magnus's polyclinic.

Among 49,200 patients there were 3688, or 7.5 %, with myopia in both eyes; 2688, or 7.3 %, had myopia of less than 6. D, of which



65.3 % were males and only 34.7 % females. In high myopia the ratio was reversed, there being 36 % of males and 64 % of females. Among the cases of high degree only a third of the males and a fifth of the females were engaged in close work, so that the other cases must be regarded as so-called genuine cases of myopia. The highest degrees of myopia (10. D or over) were found in women twice as often as in men ; in the latter, this high degree was particularly rare in those who did much near work.

Fundus complications were twice as frequent in myopia above 10. D as in myopia between 6. and 10. D; the most frequent complication being changes at the macula, and detachment being rare. The greatest number of complications was found in the fifth decade of life. An inheritance of myopia could be excluded in more than two thirds of the cases of high myopia.

VOIGT (264) reports on the results of 100 eyes with high myopia (over 15. D) operated on in the Leipsic clinic. Forty patients with 57 eyes were operated on by Fukala's method, and in 54 with 81 eyes primary linear extraction was done as Sattler advised at the Heidelberg Congress in 1898. When the latter method was used, the course of healing was shorter and the number of operations less, but loss of vitreous was more frequent, without, however, rendering the final result less favorable. Two eyes were lost by infection after primary linear extraction and one after discission of secondary cataract—two per cent. of loss. Within a period of from one to thirteen months after the operation there was detachment of the retina in 9 cases, in 5 of which no cause could be discovered, and in 3 patients macular hemorrhages took place later. In general both eyes were operated upon in order to secure binocular vision and to prevent the use of the unoperated myopic eye for near work with the associated excessive convergence.

CHEVALLEREAU (265) combats the idea that accommodation plays a part in the etiology of myopia. It is wrong not to give a myope his full correction. The writer cannot agree with Javal, who in low degrees of myopia did not give concave glasses for distance but ordered them for near, correcting the vision for a distance of 25 *cm* without accommodative strain. The studies of Giraud-Toulon proved that myopia and its complications were caused by the strain of convergence. Chevallereau corrected the myopia in full for distance and for 33 *cm* near. In agreement with Förster (1883), Dor (1897), and others he had very good results with this method.

BERGER.



SULZER (266) presented a woman of twenty-three who had been infected with syphilis eleven months before, in whom in the course of a few weeks a myopia of 9. or 10. D had developed. In each eye there was a posterior staphyloma which had increased since the patient came under his observation. The writer recalls two cases reported by Kugel (*Graefe's Archiv*, xvi., p. 323) in which in consequence of metastatic chorio-retinitis (following chronic meningo-encephalitis) a considerable increase had taken place in the length of the axis of the ball.

BERGER.

RÖMER and DUFOUR (267) object to the view of Morat and Doyon, that the sympathetic is to be regarded as a nerve checking accommodation, since they show that the enlargement of the reflex from the anterior surface of the lens, shown by these writers to occur when the sympathetic was excited, is not an absolute indication of flattening of the anterior surface of the lens because at the same time a dilatation of the pupil takes place. They were able, further, by electrical excitation of the ciliary muscle in the dog to show a movement of a needle sticking into the muscle which corresponded to a contraction of the muscle. The needle remained fixed, however, when during the contraction the sympathetic was excited, and a needle thrust through the cornea and impinging on the lens capsule also remained fixed when the sympathetic was excited. Therefore the sympathetic can have no influence on accommodation.

WEIDLICH (269) states that the contraction of the pupil in accommodation is of optical significance in two respects: 1. A certain uniformity of luminosity in the retinal image is obtained for objects at various distances, since if the pupil remained always of the same width near points would send broader bundles of light into the eye than points farther away. 2. The spherical aberration is diminished because the peripheric rays are cut off; since with increased curvature of the lens the central area, in which the peripheric rays do not cause disturbance, diminishes, the contraction of the pupil by limiting the central area prevents the formation of diffusion circles.

#### VII.—MUSCLES AND NERVES.

270. **Elschnig.** Diagram of the mode of action of the motor muscles of the eye. *Wiener klin. Wochenschr.*, No. 35, 1902. (A very plain graphic schema.)

271. **Heimann.** Unilateral nystagmus. *Klin. Monatsbl. f. Augenheilk.*, xl., 11, p. 99.

272. **Simon.** The importance of unilateral nystagmus for the doctrine of ocular movements. *Centralbl. f. prakt. Augenheilk.*, xxvi., p. 113.
273. **Simon.** On Hering's experiment with the falling balls in cases of strabismus. *Ibid.*, xxvi.
274. **v. zur Nedden.** A peculiar case of disturbance of motility in an eye. *Klin. Monatsbl. f. Augenheilk.*, xl., 11, p. 25.
275. **Varese.** A congenital and hereditary anomaly in the movement of the eye. *Arch. di Ottalm.*, ix., 3-4.
276. **Terrien.** Traumatic paralysis of the inferior rectus muscle. *Arch. d' opht.*, xxii., 4, p. 274.
277. **Fröhlich.** On tenotomy and muscular advancement. *Arch. f. Augenheilk.*, xlv., p. 304.
278. **Schoeler.** On squint operations in cases of congenital paralysis of the external rectus muscle. *Berl. klin. Wochenschr.*, No. 33, 1902.
279. **Koster.** The operative treatment of strabismus complicated with torsion of the ball. *Zeitschr. f. Augenheilk.*, viii., p. 1.
280. **Neuburger.** Paralysis of the ocular muscles after severe hemorrhage. *Centralbl. f. prakt. Augenheilk.*, xxvi., p. 161.
281. **Gelpke.** On the prognosis of ocular paralyzes of intracranial origin. *Beiträge zur Augenheilk.*, lii., p. 51.
282. **Berger and Loewy.** On the trophic nerves of the cornea. *Bull. de la soc. de biologie de Paris*, June 7, 1902.
283. **Posey.** Unusual choreiform alterations in the width of the palpebral fissure of both eyes occasioned by spasm of the levator palpebræ muscles. *Journ. Mental and Nervous Disease*, July, 1902.

HEIMANN (271) rubricates unilateral nystagmus as appearing : 1, in squinting weak-sighted eyes; 2, in cases of nervous and cerebral disease; 3, in the spasms nutans of children. In the first form the writer believes that with the impulse to fixation the child turns the eye in various directions, but this movement soon ceases in the good eye while it continues in the amblyopic.

SIMON (272) observed two infants, one 2 months and the other 14 months old, in whom nystagmus developed on account of a corneal opacity. In one case the opacity and the nystagmus were unilateral, in the other both eyes were affected, but the opacity of the left eye clearing up more quickly, the nystagmus ceased first in this eye. The writer states that these observations accord with difficulty with Hering's law, that from birth the eyes are in connection and always are innervated equally. They indicate rather that the connection at birth is slight and increases more and more with advance in years.

SIMON (273) reports four further cases of periodic divergent strabismus in which, notwithstanding an imperfect union of stereoscopic images, Hering's experiment was successfully performed,

there being thus binocular fixation, so that on account of the latter and not in spite of the squint the experiment resulted positively, and this can rightly be regarded as a criterion of binocular vision.

V. ZUR NEDDEN (274) reports first on a fourteen-year-old patient with a congenital defect in motility in the left eye toward the left and a limitation toward the right. With forceps the ball could easily be abducted, but attempts at adduction were prevented by an obstacle. The author assumes that in place of the external rectus there was an elastic band limiting motility inward. In the second case a patient of twenty-two had ptosis and divergent strabismus in the right eye. It was noteworthy that when both eyes looked to the right the right eye deviated outward, when both eyes looked to the left the right eye deviated down and in, but by itself alone when the left eye was covered the right eye could not be moved outward. In making a tenotomy of the right external rectus it was found that the tendon was inserted very far back.

VARESE'S (275) patient was a young man whose left eye when he looked to the right did not turn to the right but sank into the orbit. The other movements of the left eye were all possible, though of limited extent, without any sinking into the orbit. Only when the movement was accomplished by straining the muscles there was a slight retraction of the left eye. The author believes that there was a faulty development of Tenon's capsule, particularly in the part composing the muscle sheath, so that the recti exercised traction in a purely perpendicular direction without sufficient working in opposition of the oblique and Tenon's capsule, which because of its insufficient attachment at the orbital margin was drawn backwards.

TERRIEN'S (276) patient was a girl of thirteen, who, three weeks before, after a blow with a broomstick, had hemorrhage of the nose and a swelling of the left antral region; there then came on paralysis of the left inferior rectus with corresponding diplopia. A bony fracture of the margin of the orbit could be excluded. Three weeks later, on blowing her nose, dark liquid blood and a large coagulum escaped from the left nostril, the paralysis passed off, and the antrum could be transilluminated again. Probably the hemorrhage in the antrum reached to the floor of the orbit and mechanically interfered with the function of the inferior rectus.

V. MITTELSTÄDT.



FRÖHLICH (277) prefers muscular advancement, even in slight deviations, to tenotomy, and he describes the technique he employs. In deviations of moderate degree he does a bilateral advancement without tenotomy of the antagonists. His experience leads him to believe that by this operation one can more surely obtain a complete correction with the least possible insufficiency and without unpleasant late results.

SCHOELER (278) reports on the unusual operative course of three cases of congenital paralysis of the externus (among eight cases operated on), once in capsular advancement of the externus, once in dividing the tendon of the internus, and once in preparing the tendon of the externus and of the internus, the ball was opened and the vitreous exposed. The writer calls attention to this accident, which may be due to a flat adherence between the tendon and the sclera, but which does not interfere with the course of healing, in order to prevent an unpleasant surprise when this accident occurs.

KOSTER (279) discusses the operative treatment of strabismus due to paralysis of ocular muscles, and comes to the following conclusions:

1. Post-paralytic strabismus may be operated on when the paralysis itself has practically passed off. Even extensive deviations can then be corrected by tenotomy or advancement in one eye or both.

2. Temporal or nasal rotary strabismus must be corrected chiefly in the eye in which it has arisen. Convergent and divergent strabismus, as well as strabismus sursum- or deorsum-vergens, can be corrected on either eye, although one must take into account the extent of the field for the gaze.

3. In order to correct rotation (torsion) of the eye, one may employ either:

- (a) Advancement of the inferior rectus or tenotomy of the superior rectus for temporal rotation, and the contrary for nasal rotation.

- (b) Tenotomy of one of the rectus muscles with division of Tenon's capsule to one side of the muscle tendon and parallel to the limbus of the cornea, on that side of the tendon toward which the eye must be rotated.

- (c) Lateral advancement of the insertion of one of the rectus muscles in the direction opposite to the rotation wished for. For every  $3^{\circ}$  of temporal rotation the tendon must be shortened



1 mm, and 1 mm also for every 9° of nasal rotation. One must take care to divide Tenon's capsule completely along the ball in a direction perpendicular to the tendon and not along the muscle.

The lateral advancement of the insertion must be about 3 mm for all degrees of rotation; only when the muscular advancement is made more excessive to correct some other deviation the lateral advancement may be somewhat less.

4. In order to obtain an accurate correction it is advisable to direct the operation according to the double images.

JITTA.

NEUBURGER (280) observed in a girl of nineteen a bilateral paralysis of the external rectus, following severe hemorrhages from the stomach, with final recovery. The same paralysis with eventual recovery was seen in a woman who had suffered severe hemorrhage from placenta prævia. In the latter case there was also neuro-retinitis, and for a few days ptosis, disturbances of sensation in the region supplied by the fifth nerves, and difficulty in moving the tongue, indicating disturbances in the hypoglossus. All the symptoms passed off. They were attributed to neuritic processes in the cerebral nerves.

GELPKE (281) has tabulated 147 cases of ocular-muscle paralysis of intracranial origin, which he had personally examined, and discusses the prognosis from the following three view-points:

1. Is an intracranial ocular-muscle paralysis, with apparent good health, evidence of cerebral or spinal disease? Fifty-seven per cent. of those previously healthy remained healthy, while in one third of the cases a nervous disease manifested itself.

2. What prognostic deductions can be drawn from an intracranial paralysis in a case of brain disease that is already manifest? The best prognosis in respect of the ocular-muscle paralysis and satisfactory general condition is in the basilar forms with 61.5 %, the worst the cortical with 70 %, and between these the fascicular and nuclear paralyses. The prognosis is thus poorer the higher the location of the injury.

3. Do these paralyses throw any light upon the etiology and, consequently, upon the amenability to treatment? Fifty per cent. were due to syphilis, as follows: paralysis of the oculomotor nerve, 38.1 %; of the abducens, 17.5 %; of the trochlearis, 14.3 %. Of the nuclear paralyses 77.3 % are due to syphilis, of the basilar, 16.7 %, and of the cortical and fascicular 3 %.

Next to syphilis comes arterio-sclerosis, present in 47.8 per cent. of the paralyzes of the abducens.

BERGER and LOEWY (282) observed a case in which a traumatic basilar hemorrhage caused paresis of the left fifth, sixth, seventh, and eighth nerves and of the left sympathetic. There was neuro-paralytic keratitis on the left side with increased secretion of tears.

A careful study of a series of undoubted cases of neuro-paralytic keratitis shows that the affection cannot be explained by trauma, drying, or sensory and vasomotor disturbances, and that possibly the idea of trophic corneal nerves may be maintained. Neuro-paralytic keratitis may come on after extirpation of the Gasserian ganglion without symptoms of paralysis of the sympathetic. The operation, however, is rarely followed by neuro-paralytic keratitis. The writers explain the affection by supposing that in man in most cases the trophic fibres for the cornea running in the fifth nerve do not pass through the Gasserian ganglion but reach the orbit by way of the carotid and cavernous plexus, and then, probably through the recognized anastomoses with the supraorbital nerve and its branches, reach the cornea. It is not to be assumed that in man these trophic fibres pass with the sympathetic root to the ciliary ganglion, since section of these fibres or extirpation of the ciliary ganglion does not lead to neuro-paralytic keratitis.

Probably exceptionally in man the greater number of the trophic corneal fibres pass through the Gasserian ganglion, and in such cases extirpation of the ganglion would bring about a neuro-paralytic keratitis without symptoms on the part of the sympathetic, as for example in Gallemaert's case. The writers explain the sensory and sympathetic disturbances which so frequently accompany neuro-paralytic keratitis by supposing that the same process affects the trigeminus at the point where it receives the trophic corneal fibres and at the same time causes a lesion of the sympathetic in the carotid plexus. In their case the lesion was a basilar hemorrhage.

BERGER.

In the case related by POSEY (283) the palpebral fissure was rhythmically widened about fifteen to twenty times a minute, yet seemed to be under the control of the will. The elevation of the upper lid was produced entirely by the levator without any action of the frontalis.

ALLING.

Sections VIII.—XII. Reviewed by DR. R. SCHWEIGGER,  
Berlin.

# VIII.—LIDS.

284. **Pflugk.** On the preparation of the lid margin and lashes for operations on the eyeball. *Arch. f. Augenheilk.*, xlv., 3, 176.

285. **Pflüger.** The treatment of lagophthalmus. *Klin. Monatsbl. f. Augenheilk.*, xl., p. 527.

286. **Bossalino.** A new operative method of tarsorrhaphy. *Ann. di Ottalm.*, xxxi., 3-5.

287. **Meyerhof, Max.** The making of new lids and transplantation in ophthalmic surgery. *Arch. f. Augenheilk.*, xlv., p. 97.

288. **Büdinger.** A method of restoring defects in the lids. *Wiener klin. Wochenschr.*, 1902, No. 25.

289. **Tiffany, Flavel.** Palpebral autoplasty, a large flap of skin used to restore the lids. *Rec. d'ophth.*, xxiv., p. 218.

290. **Santucci.** A contribution to the study of ocular dermoids. *Giorn. med. del R. Esercito*, l., 1.

291. **Rindfleisch.** A case of unilateral grayness of the lashes in a child. *Klin. Monatsbl. f. Augenheilk.*, xl., 11, p. 53.

292. **Marple.** Infection of the lids and subsequently of the globe, with staphylococcus pyogenes albus. *N. Y. Eye and Ear Infirmary Reports*, Jan., 1902.

PFLUGK (284) found the lashes of the normal eye crowded with micro-organisms with few exceptions. These can be readily removed by rubbing the lashes with benzine.

In Basedow's disease PFLÜGER (285) substitutes for the usual pressure bandage inflated rubber bags modelled to the shape of the eye when the lids are closed. These are worn at night and for an hour at a time by day, the amount of pressure being regulated by a bandage passing over them. With this treatment he has seen an operation rendered unnecessary and the exophthalmos even diminish.

In lagophthalmus from incurable facial paralysis, in shortening of the lid, and in senile ectropium, Pflüger substitutes for tarsorrhaphy one or more subcutaneous sutures in the entire extent of the palpebral fissure by introducing two or three sutures, which at the first sitting are tightened like the string of a pouch, and are from time to time drawn tighter until they cut through.

BOSSALINO'S (286) method begins with the splitting of the intermarginal space of the lid 3 mm deep, so that in the upper segment lie the hair follicles and ducts of the glands. A double armed suture is then passed through the conjunctiva 1 mm from the margin, so that when the loop is drawn the thread lies on the conjunctiva. Both needles are then passed parallel up through the



cleft in the lid and brought out 2 *cm* above the lid margin. The mucosa is then drawn up into the cleft and the sutures tied over the skin.

KRAHNSTÖVER.

Taking as a basis three operations by Augstein, MEYERHOF (287) discusses the advantages of supplying large defects in the lids by pedunculated flaps; in one case a flap without a pedicle became gangrenous.

In the matter of replacing mucosa the writer gives a *résumé* of the literature, and inclines to the opinion that the transplantation of vaginal mucosa is best.

BÜDINGER (288) takes skin flaps from the temporal region or cheek; tarsus and conjunctiva are replaced by flaps from the auricle.

SANTUCCI (290) classifies all dermoids of the eye as follows:

1. Pure dermoids, always congenital, caused by the turning in of elements of the upper lid in foetal life.

2. Congenital lipomas.

3. Lipodermoids.

4. Teratomata covered with conjunctiva. These are rare, arise from residua of the third lid, and are attached to the eyeball. Often they are subconjunctival lipomas with the turning in of lachrymal or Krause's glands. In this form there are found also muscle, cartilage, and bone.

5. Teratomata covered with skin. Of five cases observed by the writer two fell under 1, two under 3, and one under 5.

KRAHNSTÖVER.

In a weakly child of five RINDFLEISCH (291) found that on one eye which was otherwise normal the lashes had been growing gray for three months. The child exhibited no special morbid symptoms but remained weak after an inflammation of the lungs some time before. Microscopically he found the lashes, which were fast in the lid margin, lacking in the usual collection of air bubbles in the cortical layer.

MARPLE'S (292) case showed ulceration at the margin of the lids, and later of the ocular conjunctiva, covered with a gray exudate resembling diphtheria. The glands of the jaw were swollen and some constitutional symptoms were present. Staph. pyog. alb. proved to be the cause of infection.

ALLING.

#### IX.—LACHRYMAL APPARATUS.

293. **Grimaldi.** A clinical contribution to dacryo-adenitis acuta. *Giorn. intern. delle Scienze med.*, xxiv., 8.



294. **Terson and Lefas.** Lesions of the palpebral lachrymal gland in hypersecretion of tears. *Ann. d'ocul.*, cxxvii., p. 409.

295. **Tobias.** A contribution to the knowledge of tumors of the lachrymal gland and their treatment by Krönlein's method. *Inaug. Dissert.*, Freiburg, 1902.

296. **Lundsgaard.** Does the lachrymal gland atrophy after extirpation of the lachrymal sac? *Dansk oftalm. Selskab*, March 20, 1902, and *Hospit. tid.*, June, 1902.

297. **Segelken.** The etiology of concretions in the lachrymal canaliculi. *Klin. Monatsbl. f. Augenheilk.*, xl., 2, p. 134.

298. **Tartuferi.** Pathology of chronic catarrhal and purulent dacryocystitis and curettage of the nasal duct. *Arch. d'opht.*, xxii., 3, p. 166. With several tables and many illustrations.

299. **Tartuferi.** *Ibid.* *Bull. delle Scienze med. di Bologna*, lxxiii., 2, fasc. 3.

300. **Hirsch.** On congenital dacryocystitis. *Arch. f. Augenheilk.*, xlv., 4, p. 291.

301. **Cirincione.** On the prelachrymal tumor. *Ann. d'ocul.*, cxxviii., p. 107. With illustrations.

GRIMALDI'S (293) case was in a woman of twenty-three. There was dacryo-adenitis on either side, only the palpebral portion of the gland being involved. The cause, according to the writer, was a blennorrhagic infection acquired a short time before.

KRAHNSTÖVER.

In a case of hypersecretion of the lachrymal gland which was cured by extirpation of the palpebral glands, TERSON and LEFAS (294) found changes similar to those found by Klippel and Lefas in the salivary glands of tabic patients with sialorrhœa, and by Stanculeanu and Theohari in the lachrymal glands in cases of dacryorrhœa, viz., circumlobular sclerosis, fatty degeneration and necrosis of the gland cells, and slight changes in the larger gland canals, which perhaps were of infectious nature. BERGER.

LUNDGAARD (296) made various microscopic sections from a patient who died some time after an extirpation of the tear sac which relieved his lachrymation. The preparations were: 1. Section through the scar, which showed that the cause of the cessation of lachrymation does not lie in the formation of a filtration canal. 2. Sections of the lachrymal gland on either side. These offer no support for the view held by some authors that the cessation of the lachrymation is due to an atrophy of the gland. DALÉN.

SEGELKEN'S (297) patient, after a bit of hay had fallen into his eye, was treated for more than a year with astringents because of an intense inflammation of the tarsal and bulbar conjunctiva with mucous and purulent secretion. The upper canaliculus appeared

swollen and after being split open evacuated dark-brownish concretions which microscopically were found to contain leptothrix. Cultures were not successful. Segelken regards culture experiments as being necessary to distinguish between leptothrix and actinomyces. The conjunctival secretion contained staphylococci and ceased after the canaliculus was cleared out.

TARTUFERI (298) removed after death the nasal duct of each side from patients in whom in life a diagnosis of chronic purulent dacryocystitis had been made, and also a number of ducts from new-born infants. Both the sacs and the canals exhibited great variations in form and calibre and in some instances longitudinal septa with accessory crypts and canals. These formations are in part congenital and were found on the healthy side and in the new-born. They predispose to lachrymal disease. In other cases they are the products of inflammation of the mucosa in which there are epithelial changes and diffuse or circumscribed small-celled infiltration of the tissues, leading to the formation of papillary proliferations and polypi and finally to narrowing of the canal, division into several canals, and blocking of the lumen completely. Since the canal is primarily affected and more affected than the other parts it is necessary to restore its lumen, and when probes will not accomplish this curettes must be freely used. The author pictures a number of curettes of different construction.

V. MITTELSTÄDT.

In several cases of congenital dacryocystitis HIRSCH (300) found pneumococci which probably had come from the vaginal secretion of the mother. By the simple therapy of expressing the contents of the sac, one often sees that the cocci cannot have the relation to this blennorrhœa that they are supposed to have. Hirsch found the left side affected oftener than the right.

CIRINCIONE (301) believes with Rollet that for the development of a prelachrymal abscess a preformed lymph space (described by Deval in 1849 as a synovial sac) plays a rôle. The differential diagnosis between prelachrymal tumor and ectasia of the lachrymal sac may present great difficulties. In the former the tear passages should be patulous, yet the writer has observed one case in which liquid injected into the upper canaliculus did not flow down to the nose because the prelachrymal tumor had compressed the sac. Nor is the prelachrymal tumor always movable. It is mostly due to caries and rarely arises from disease of the sac.

BERGER.

(*To be continued.*)

## MISCELLANEOUS NOTES.

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### Obituary.

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January 9, 1903, Dr. **Photinos Panas**, professor of clinical ophthalmology at the medical faculty of the University of Paris, passed away at his beautiful country-seat of Roissy, where he so often entertained, with exquisite hospitality, Frenchmen, and foreigners of all nations. He was born in January, 1832, at Cephalonia, the present island of Samos. His father, a physician, gave him a very careful classical education. He was distinguished by extraordinary endowments and unusual working power. He was graduated with great distinction æt. twenty-two. His first works were chiefly devoted to surgical anatomy; his thesis was on the Anatomy of the Nasal Fossæ and the Tear-Passages, the diseases of which he studied later with unrivalled thoroughness and success. From this moment he nourished the hope that ophthalmology, some day, would also be represented in the medical faculties of the French universities. During the next years he prepared himself for the career of medical teacher. From 1859 to 1863 he gave courses on anatomy and operative medicine at the École pratique, in 1859 a public course on surgical anatomy, in 1860 a public course on the physiology of the nervous system and the sense organs, in 1861 a course on surgical pathology.

He had a hard time; his zeal for scientific and didactic labor retarded the creation of a clientage. Nélaton, Laugier, Guyon, and other distinguished professors were his friends. At the beginning of the war in 1870, Panas was surgeon at the Hôpital St. Louis, where he devoted himself to the relief of the unfortunate soldiers. In 1873 he was appointed by the faculty to give a complementary course on ophthalmology. At that time he published his *Lectures on Strabismus and Ocular Palsies*. In 1877



he was elected President of the Surgical Society, and entered the Academy of Medicine in the section of Medical Pathology. In 1879 new chairs were created and Panas was at once appointed to that of ophthalmology. The equipment of his service was meagre at the beginning, but by indefatigable labor he made it to be one of the best ophthalmological clinics, with an abundance of beds, a fine laboratory—his own creation,—from which very important investigations have emanated, some by his assistants under his auspices. In January, 1881, he founded, with LANDOLT and PONCET DE CLUNY, the *Archives d'ophtalmologie de langue française*, which has survived him as one of the important periodicals of its kind. He played a conspicuous rôle in the International Ophthalmological Congresses.

The character of Professor Panas was beyond praise. He was kind, sincere, indefatigable in the pursuit of his duties, and lenient with the shortcomings of his pupils. His operative skill and resourcefulness were of the highest order. He was an ardent advocate of the simple extraction of cataract, which he did with consummate dexterity and sagacious judgment ripened by great experience. Though the reviewer can not share all his views, he confesses that Panas was one of the most influential among his teachers. At the beginning of his professional career, Panas felt many gaps in his knowledge, but it was surprising to see how well he filled them up. When in foreign prints he found a good figure to clear up a knotty point he at once had it copied and embodied in his large collection of illustrations. They ornamented the walls in his clinical audience room. His lectures were interesting and instructive, his oratory was fluent and pointed.

The disease of which he died was insidious, and heart-rending in its course. Six years before his death, after an apparently insignificant accident, he noticed a slight weakness and waste in the muscles of his left hand. Though apparently of no consequence, he did not deceive himself, but recognized the symptoms of a progressive muscular atrophy of the Aran-Duchenne type. During six long years he noticed, without uttering a plaint, one group of muscles after another dwindle until those hands and arms of pristine fairy-like dexterity were powerless appendages to a calm, resigned heart and head, manifesting the dominating will of the great soul of a martyr.

If we consider his life from the standpoint of personal and political economy, we have to call it a complete success. To pass



judgment in this sense, we have to consider his family life and his productive work. His family and social life was of the happiest. His wife, a Greek also, brought up in England, though herself suffering for a time, was to him a most congenial consort. She shared his tastes and habits, unostentatiously appreciating his position and his worth. Nothing could surpass the mutual tender care which bound this couple together.

The scientific and practical work of Panas was of the highest order. He was the head of the modern French school of ophthalmology, preceded by the immortal benefactor of mankind, JACQUES DAVIEL, surrounded by GAYET, of Lyons, and others, and followed by a host of able pupils, of whom one, F. de Laperonne, deservedly has been appointed his successor.

The *work* of Panas was grounded on his proficiency in anatomy and surgery. With this broad basis he turned his energy to the most prominent of the so-called specialties, which he mastered with astonishing rapidity and completeness, excelling, with logical sequence of his past, in the pathological and surgical departments of ophthalmology.

The chief publications of Panas are collected by Dr. de Laperonne and published in the *Arch. d'ophtalmologie*. Most of them have been reviewed in the Systematic Reports on the Progress of Ophthalmology, in these ARCHIVES. His most important literary production, his *Traité des maladies des yeux*, in two volumes, 1894, deserves special mention. It is a fundamental work, in classical French, combining a liberal digest of the incident early and modern literature, French and foreign, with the independent views of an author of rare intelligence, erudition, and experience. This is the legacy which Panas left to posterity, and which, as De Laperonne says, will stay as the French Mackenzie, the classical English treatise, which is read to-day, sixty years after the death of its author, with interest and profit by any thorough oculist.

H. KNAPP.

**David Little**, of Manchester, died November 27, 1902, in his sixty-third year. He studied in Edinburgh, was appointed house surgeon in the Ophthalmic Hospital at Manchester in 1863, was lecturer on ophthalmology in Owen's College from 1878 to 1899, president of the Ophthalmological Society of the United Kingdom in 1902. He was not a prolific writer, but a well-informed ophthalmologist and a judicious and skilled operator, particularly for

cataract. He was the first medical officer in the large, well-appointed and equipped modern eye hospital in Manchester, which compares well with the best eye hospitals in Great Britain. He was a frequent, welcome, and esteemed attendant of the International Ophthalmological Congresses.

Dr. **Isidor Herrnheiser**, Privatdocent, editor of the *Prager medicinischen Wochenschrift*, for many years the regular collaborer of these ARCHIVES, died of apoplexy at Prague, December 23, 1902. He was a capable and well-trained ophthalmologist, and published a number of excellent papers, for instance, "Retinitis Septica," "Metastatic Inflammations of the Eye," "On the Causes of Myopia in Youth."

Prof. **Alfred Graefe** died at Innsbruck, Tyrol, September 1, 1902. He was a cousin of Albrecht v. Gräfe, his pupil and assistant. He was professor of ophthalmology at the University of Halle, co-editor with Sämisch of the first edition of the *Handbuch der Ophthalmologie*, a fertile writer, especially on muscular anomalies. He resigned his professorship about five years before his death, on account of ill-health.

Dr. **J. W. May**, professor of ophthalmology and otology and dean of the College of Physicians and Surgeons at Kansas City, Mo., died September 29, 1902, æt. fifty-two.

Dr. **F. Despagne**, of Paris, former chief of Galezowski's Clinic, secretary of the *Recueil d'ophthalmologie*, and secretary of the Paris Ophthalmological Society, died August 11, 1902.

Dr. **Tatchuchiro Inouye**, Jr., died at Tokio, Japan, in the fall of 1902.

Dr. **Nathaniel Feuer**, professor of ophthalmology, University of Buda-Pest, died November 25, 1902, aged fifty-eight.

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#### APPOINTMENTS AND NEWS.

Appointed :

Dr. JOHN F. CARPENTER, instructor University of Pennsylvania.

Dr. CIRINCIONE, late professor in Palermo, now professor in University of Siena.

Dr. JAS. BORDLY, Jr., professor in Woman's Medical College, Baltimore.

Dr. ERNST HERTEL, professor in University of Jena.

Dr. GEO. HUSTON BELL, assistant surgeon New York Eye and Ear Infirmary.

Drs. A. G. THOMSON and CHAS. J. JONES, assistant surgeons, and Drs. HOMER J. RHODE and ARTH. J. BEDELL, resident physicians, Wills Hospital, Philadelphia.

Dr. J. A. WOODRUFF, ophthalmologist to St. Luke's Hospital, Chicago.

Dr. WILBUR B. MARPLE, surgeon New York Eye and Ear Infirmary.

Dr. A. N. ALLING, clinical professor Yale University.

Dr. BRAUNSCHWEIG, Halle, Germany, titular professor.

Mr. E. TREACHER COLLINS, ophthalmic surgeon and lecturer, Charing Cross Hospital and Medical School, London.

In the recently organized Post-Graduate Medical School, Washington, Drs. BURNETT, BETT, BUTLER, WILMER, FOX, and SHUTE are professors of ophthalmology, and DUFOUR adjunct professor.

Dr. SOLOMON KLEIN, professor, Vienna.

Dr. NAITO, attendant to Ophthalmic Hospital, Tokio.

Dr. ALLEN T. HAIGHT, E. F. SNYDACKER, W. O. NAUD, and C. W. HAWLEY, ophthalmologists to Cook County Hospital, Chicago.

Dr. ARNOLD KNAPP, professor of ophthalmology; Dr. WARD A. HOLDEN, chief of clinic and instructor; Dr. H. H. TYSON, instructor, at the College of Physicians and Surgeons, Columbia University.

Prof. C. SCHWEIGGER, of Berlin, celebrated the fiftieth anniversary of his doctorate.

The *Manhattan Eye and Ear Hospital* has opened a *Post-Graduate Course* in ophthalmology and otology. Duration: October 15th to July 15th. Dr. LEWIS A. COFFIN, Secretary.

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#### BEQUESTS, GIFTS, AND PURCHASES.

Bequest of MARY LOUISE RUGGLES, of Boston, \$3000, ANSON J. WHITE \$10,000, and Mrs. N. E. BUSH \$2000, together \$15,000, to Massachusetts Charity Eye and Ear Infirmary.

Bequest of ALEX. C. HUTCHINSON, to Eye, Ear, Nose, and Throat Hospital, New Orleans, \$20,000.



Bequest of WM. CLARK, to Newark Eye and Ear Infirmary, \$6000.

Bequests of B. PACKER to Royal Westminster Ophthalmic Hospital and the Bath Eye Infirmary, each \$2500.

A new building, 57 x 112', will be added to the Episcopal Eye, Ear, and Throat Hospital of Washington, D. C.

Owing chiefly to the meritorious efforts of Dr. RICH. H. DERBY, executive surgeon of the New York Eye and Ear Infirmary, the Board of Health instituted regular school examinations of the eyes of the pupils, the outcome of which is, in a very great number of children, the discovery of follicular and granular conjunctivitis, mostly without or with only slight mucous, very rarely purulent, secretion. All these children were ordered to be treated by oculists in private or in eye dispensaries or eye hospitals. These institutions became so overcrowded that they had not space, time, and men enough to be equal to the occasion. To relieve them, the Board of Health dedicated Gouverneur Hospital for the treatment of these patients by paid oculists, while the eye hospitals treated as many as they could. The treatment consisted primarily by expression, with subsequent applications of collyria or touching with sulphate of copper, etc. As soon as the granules and the irritation had disappeared, and there was no longer any secretion, the children were admitted to the schools again on the certificates of the oculists who attended them, stating that there was no contagiousness. The disease is not at all alarming, and infectious only in a small number. Nevertheless the measures taken by the Board of Health are eminently praiseworthy, for even if the simple follicular and non-secreting granular forms are not contagious, they should be considered as being predisposed easily to catch infectious forms which, owing to the large immigration from infected countries, are rife enough in our poorer and unclean fellow-citizens. The results of the inspections and regulations of the Board of Health have been very successful, there now is neither an epidemic of trachoma, nor a dread of it, and the education of children is not materially interfered with, as the great majority of children directed to be treated can safely go to school again in about one or two weeks.



## BOOK NOTICES.

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VI.—**Biographic Clinics.** The Origin of the Ill-Health of De Quincey, Carlyle, Darwin, Huxley, and Browning. By GEORGE M. GOULD, M.D., Philadelphia. P. Blakiston & Co., 1012 Walnut Street, Philadelphia, Pa. Price \$1.

The author of this nicely gotten-up book of 223 small 8vo pages presents the medical histories of the above distinguished men. They all exhibited great, unrestrained working power and broke down frequently; they recuperated temporarily when they discontinued their hard mental labor, by travelling and diversion, chiefly by walking and horseback riding. Resumption of their work was followed by a relapse of their old complaint, which always was cured again by the same remedy—out-of-door exercise and diversion. The author contends that it was not overwork and its consequences, but eye-strain. Reading and writing, being their chief occupation, brought about their complaint, viz., severe mental depression, indigestion, and weariness.

At the age of thirty-one, Huxley wrote: "I wish I could ascertain the exact *juste milieu* of work which will suit, not my head or will, for these can't have too much, but my absurd stomach." Open-air occupation and tramping always gave him immediate relief. He died June 29, 1895, at the age of seventy.

Our author has, with great industry, collected these and other data from authentic sources. They are interesting reading, but the reviewer cannot agree with the views of the author. Huxley noticed that at the age of thirty-nine he held his book farther than he used to do, and glasses did not help him much. It is certain, says Dr. Gould, that he had far-sighted astigmatism of 1 or 2 D at least, furthermore anisometropia and esophoria, with normal vision. Every oculist knows that hyperopic esophoria, especially if combined with astigmatism, causes asthenopia with

more or less reflex phenomena in the head and other parts of the body, but the reviewer thinks that Dr. Gould goes too far in trying to prove that all the symptoms of Huxley and the other great men he cites were dependent on errors of refraction. Digestive and circulatory troubles are very common in brain workers with sedentary habits. The reviewer has had many opportunities to examine the eyes of such men, but he failed to find refractive errors to account for their complaints, though they were zealous investigators, using instruments of precision, and were great readers and prolific writers. Their eyes mostly were normal or myopic. Their chief remedy to keep in good health consisted in daily walks of an hour or two, and a summer vacation of two or three months in the Alps.

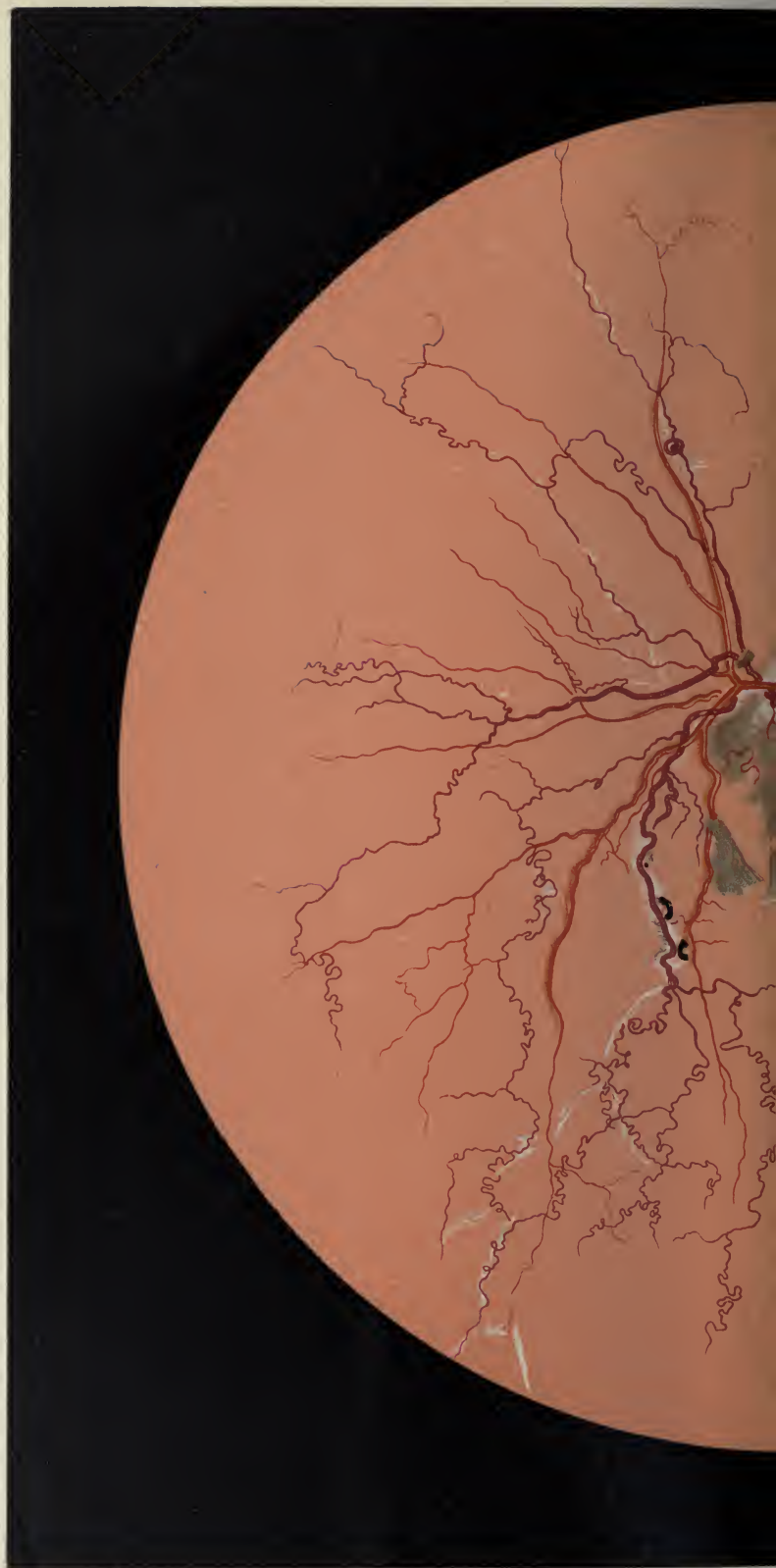
H. KNAPP.







Fig. 1.



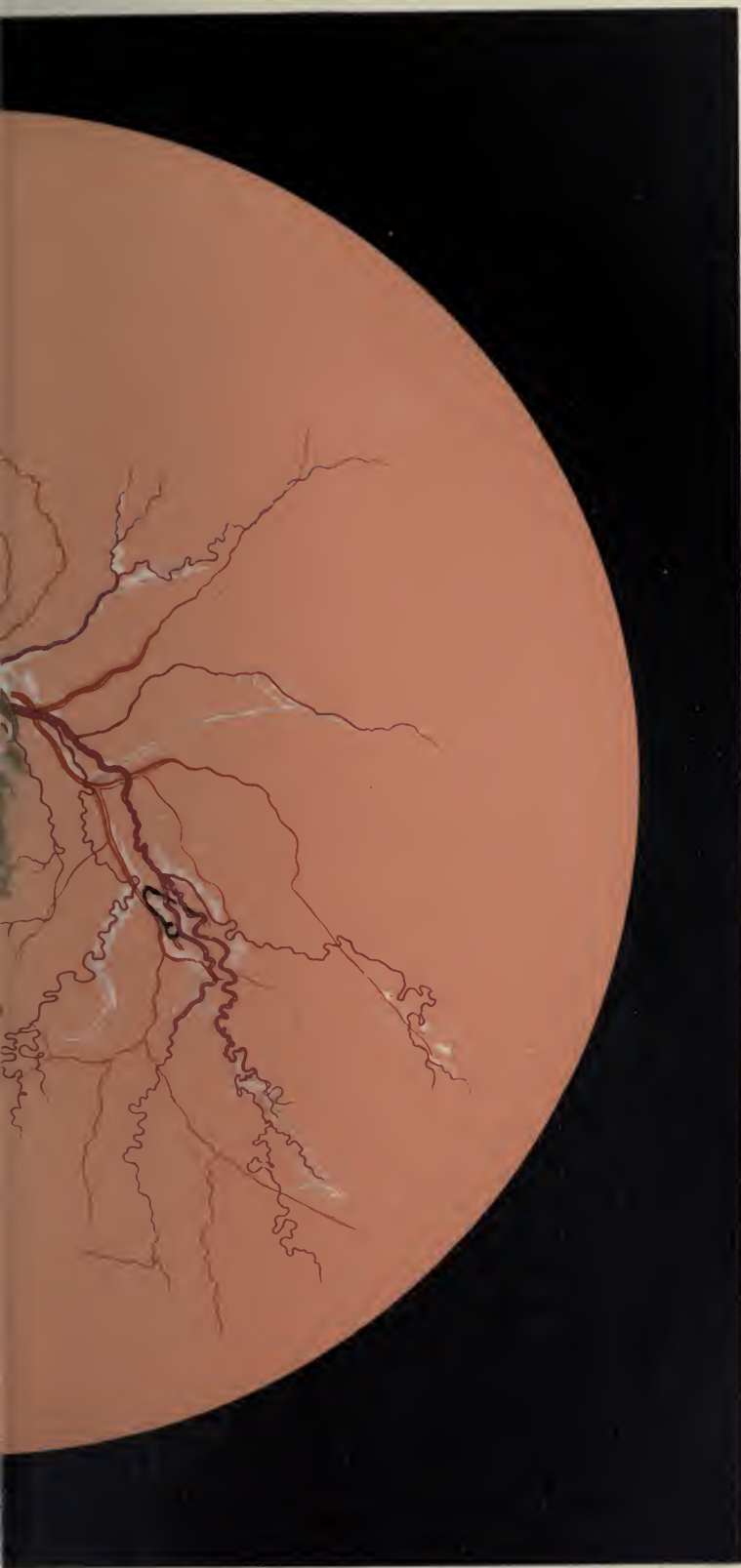
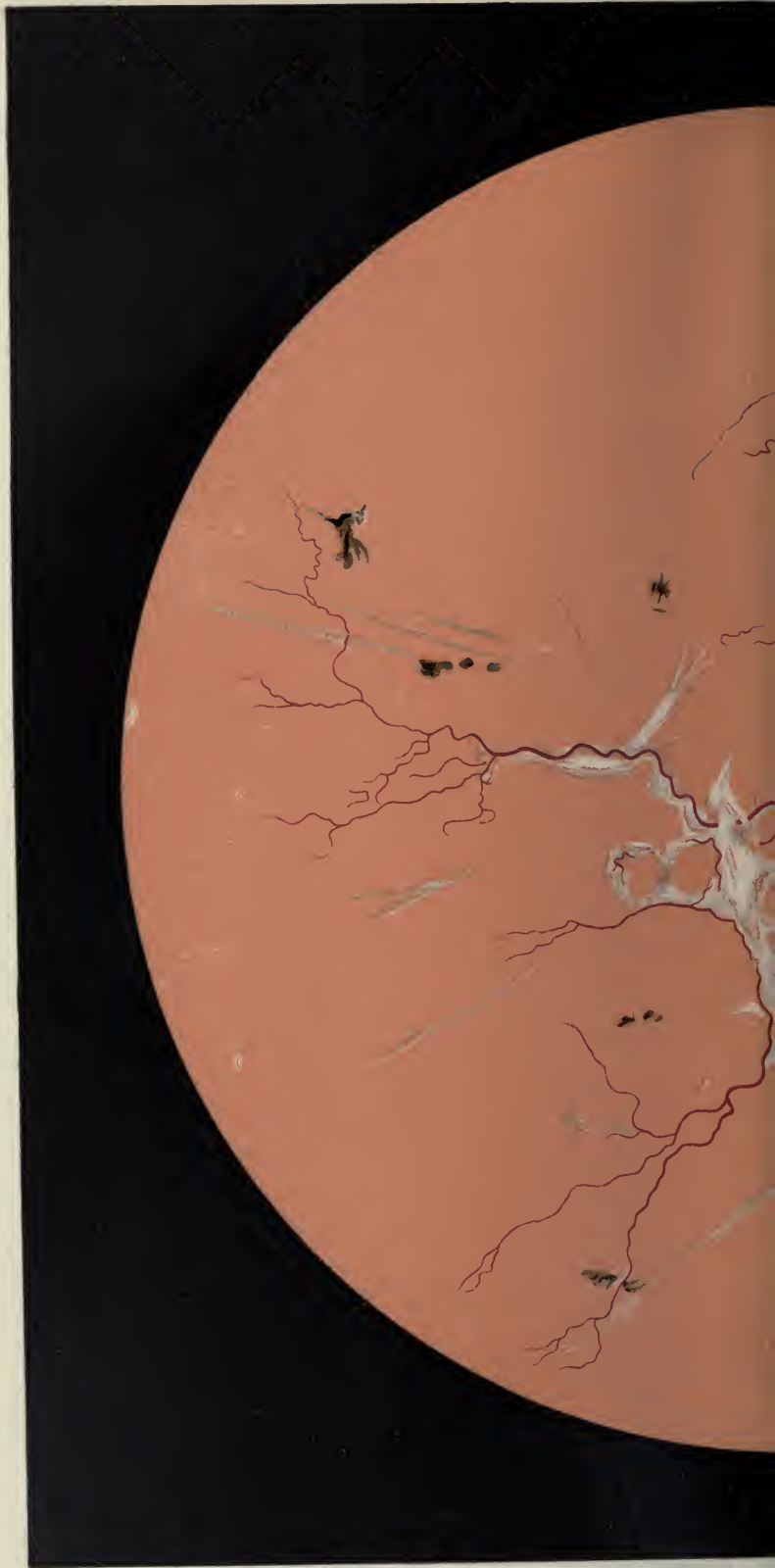








Fig. 2







## ARCHIVES OF OPHTHALMOLOGY.

APLASIA OF THE PAPILLA AND RETINAL  
VESSELS WITH A PECULIAR ANOMALY  
AT THE MACULA IN EYES OTHERWISE  
NORMAL.

BY DR. ALEXANDER DUANE, NEW YORK.

*(With two text-figures.)*

THE following case seems worthy of record :

Fred R., aged two and one-half years, was brought to the Cornell Dispensary, December 5, 1902. At age of three months it was noticed that child paid no attention to objects waved before the eyes, and since that time has never seemed to see anything. Other senses good. Hearing in particular is keen, and child discriminates tunes and is fond of music. Physical development in general good, although child can neither stand nor walk. Mental development said to be equal to the ordinary. Temper and disposition good.

No illnesses of any kind. No convulsions except one attack during teething at age of one.

Patient when first examined restless, and made continual purposeful movements of head, arms, hands, and legs. When seen at other times was quiet.

Both eyes make searching to-and-fro movements, and besides show a constant, very slight, but rapid nystagmus, mainly vertical in direction.

Apparently no perception of light. Winks at times when light is thrown into eyes, but at other times does not, and seems not to follow the light.

Eyes normal in size. Sclera, cornea, iris, and lens normal. Pupils moderately wide and equal. No light-reaction.



Large floating opacities in vitreous of left eye; none in right.

Discs in both eyes irregularly oval; are of a uniform dirty white, devoid of markings, and look flat and inconspicuous. The papillary vessels are limited to two very slender twigs, arising in each eye from the centre of the disc and running respectively up and down to the border of the disc. Those of the left eye (Fig. 2) cannot be traced beyond the disc; those of the right eye (Fig. 1), which can be followed a little way into the retina, all appear to bend away to the nasal side.

Except for these twigs, *no vessels, either retinal or choroidal, are to be seen in the entire fundus.*

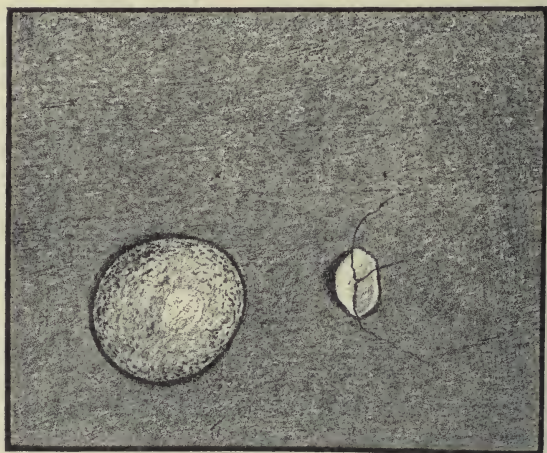


FIG 1.—RIGHT EYE (ERECT IMAGE).

About one papilla-breadth from the disc, to its temporal side, there is in each eye a nearly *circular area, several disc-diameters wide*. The area is bounded by a sharp-cut dark border, so as greatly to resemble in appearance a bubble as seen under the microscope. Within this area the choroidal red is still present, but rather paler than in the surrounding fundus, and there is also a little scattered brownish pigment. There does not seem to be any special difference in level between the floor of the area and the surrounding fundus, although precise estimates cannot be made on account of the constant nystagmus and also because of the absence of any distinctive markings upon which the ophthalmoscope could be accurately focused.

The surrounding fundus, apart from the total absence of vessels, appears perfectly normal.

The refraction, estimated by skiascopy under atropine, was about 0.5 D of myopia.

Here there was evidently *aplasia of the retinal vessels and probably also of the papilla*, which besides being bloodless was misshapen, pale, inconspicuous, and destitute of the usual markings. The appearances of the disc, indeed, were much like those obtaining in a marked post-neuritic atrophy. There were, however, absolutely no other evidences of in-

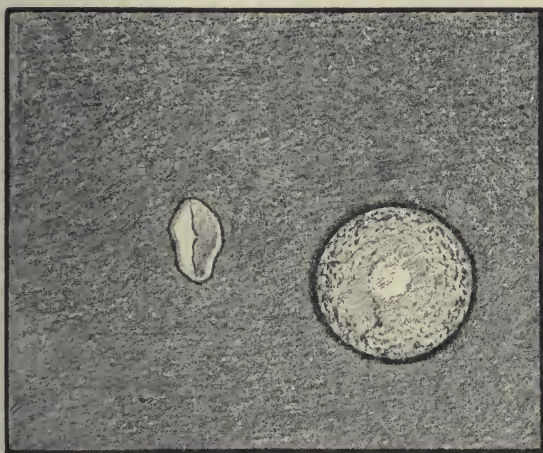


FIG 2.—LEFT EYE (ERECT IMAGE).

flammation. Moreover, according to the authors to be cited later, these congenital anomalies of the retina and nerve are rarely, if ever, due to inflammation, even when the gross appearances are those of an inflammatory process. The changes in the disc in the present case, therefore, seem more likely to be attributable to arrest of development rather than to an antecedent neuritis.

Furthermore, there was at the macula in each eye a large circular area, which gave the appearance of there being *either a defect in the retina or else an abrupt, cyst-like, perfectly transparent protrusion of the retina at this spot*. Which was the condition actually present could not be

stated with certainty, owing to the entire absence of retinal vessels or other markings that would have shown the structure and contour of the membranes. There was certainly no protrusion of the choroid, and it is not easy to understand how, without a simultaneous protrusion of the choroid, a cystic protrusion of the retina could have existed for two or three years and maintained its transparency. Yet the sharp black edge of the area, resembling greatly the dark rim of a bubble seen under a microscope, or of the edge of a dislocated lens when seen by transmitted light, strongly suggested the presence of a smooth, transparent, bladder-like prominence.

The case seems to be almost unique in that both the peculiarities described were present in eyes otherwise well formed and in a child of fairly normal development.

*Aplasia of the optic nerve* is not infrequent in *anencephalia*. In this condition various investigators<sup>1</sup> have found the ganglion-cells wanting in the retina and the nerve-fibres absent in both retina and optic nerve, the latter containing only glia or connective tissue.

Rosenbaum<sup>2</sup> has found a similar condition in *congenital hydrocephalus*.

Van Duyse<sup>3</sup> in a *cyclopean eye* found the optic nerve and papilla replaced by a mass of connective tissue, enclosing numerous vessels and ciliary nerves. There were also, at spots corresponding to what would have been the maculæ in the two component eyes, areas in which the choroid and pigment epithelium were absent, and the retina reduced to the supporting structures only ("coloboma of the macula"). There was furthermore a median inferior coloboma of the choroid; also two lenses; and finally two pupils, each in connection with a coloboma of the iris and ciliary body.

There may be more or less aplasia of the nerve and of the central vessels in *microphthalmus*. Dötsch<sup>4</sup> cites a remark-

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<sup>1</sup> Wahl, Manz, Pétren, and others cited by Rosenbaum (*Ztschr. f. Augenh.*, vii., 2, 1902), who records two additional cases.

<sup>2</sup> *L. c.*

<sup>3</sup> *Arch. d'ophthalmol.*, 1899, pp. 25 etc.

<sup>4</sup> *Arch. f. Ophth.*, 1899 (1), p. 59.



able case, observed in a two-days-old child. The right eye measured 7.5 x 8.0mm. In this the nerve was replaced by a thin connective-tissue strand, which contained no nerve-fibres. The retina also was devoid of nerve-fibres, but did contain ganglion-cells, although these were fewer than normal. There were no retinal vessels and no trace of a papilla. The retina showed in places various abnormalities of structure; the choroid, ciliary body, and iris were undeveloped; there was a coloboma of the iris and ciliary body; and the cornea was opaque. In the left eye, which measured 8 x 10mm, the cornea was opaque and there were other changes, but the papilla, nerve, and retinal vessels were present, and the retina was fairly normal.

The total absence of retinal vessels in the right eye in the case last cited is noteworthy. For, as Dötsch points out, while the central artery is frequently absent in microphthalmus,<sup>1</sup> there is generally a substitute for it, formed by one or more vessels which perforate the sclera or the edge of the lamina cribrosa.

It is to be noted that in none of these cases of congenital anomaly were the changes such as could be attributed to inflammation. Hess<sup>2</sup> in discussing microphthalmus shows that what with the ophthalmoscope, and even at first glance with the microscope, may look like inflammatory products (*e. g.*, pigment deposits, etc.) are not really inflammatory in nature.

In the cases just cited there was in all some obvious and considerable vice of development (anencephalus, cyclocephalus, microphthalmus, congenital hydrocephalus), combined generally with marked abnormalities in other parts of the eye beside the nerve and retina. Apart from such abnormalities, aplasia of the retinal vessels and of the nerve seems very rare indeed. Interesting anomalies in the formation and appearance of the nerve and papilla, occurring in eyes of otherwise normal aspect, have been described by Purtscher,<sup>3</sup>

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<sup>1</sup> Becker, *Arch. f. Ophth.*, xxxiv., 3; Hess, *ib.*, xxxiv., 3; Bach, *ib.*, xlv., 1.

<sup>2</sup> *L. c.*

<sup>3</sup> *Arch. f. Augenheilk.*, xii. (1883), p. 421.



Eversbusch,<sup>1</sup> Magnus,<sup>2</sup> Derjavine,<sup>3</sup> and others, but these cases have not even a remote resemblance to the one under consideration. I have not yet been able to find a record of an ophthalmoscopic examination of an eye, exteriorly normal, in which the retinal vessels were, as in my case, almost totally absent.

The *second condition* present in this case also seems very rare. It is obviously quite different from the so-called coloboma of the macula, in which the pigment epithelium and choroid are absent, so that the sclera is exposed. The only case that I can find which at all resembles it is one described by Birnbacher.<sup>4</sup>

A man, twenty-one years old, had  $V = \frac{6}{8}$  in each eye with  $-7.00D$ . Field normal; no central scotoma. Light-sense normal. Papilla and retinal vessels normal.

In each eye the macula was occupied by a circular structure 1.5 or more papilla-diameters wide. A deep black pigment ring surrounded the figure and sent jagged processes into it. Choroidal vessels crossed it; retinal vessels ran close to it, but did not cross it. The structure, although disc-like in appearance, was evidently conoidal, and, in fact, many *mm* high, for, while its apex (including the choroidal vessels which crossed over it) showed by the ophthalmoscope a refraction of  $-8D$  in one eye and  $-7D$  in the other, the papilla and remaining fundus—even right up to the edges of the prominence—had a refraction of  $-25D$ .

Here there was evidently a finger-like protrusion consisting of both choroid and retina, and possibly also of the sclera as well, although Birnbacher thinks this unlikely on account of the very sudden change in elevation at the margin of the prominence. In any event, the case differed from mine, since in the latter there was no elevation of the choroid and possibly none of the retina, though the appearances strongly suggested a protrusion of the latter.

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<sup>1</sup> *Klin. Monatsbl. f. Augenheilk.*, 1885, p. 1.

<sup>2</sup> *Ibidem*, 1885, p. 43.

<sup>3</sup> *Więstnik Ophthalmolog.*, Jan.-Feb., 1896, cited in *Arch. d'ophtalmol.*, 1896.

<sup>4</sup> *Arch. f. Augenheilk.*, xv. (1885), p. 159.

## RETINAL ROSETTE FORMATIONS OF NEUROGLIA IN INFLAMMATORY PROCESSES.

By BROWN PUSEY, M.D.,

INSTRUCTOR IN PATHOLOGY OF THE EYE IN THE UNIVERSITY OF CHICAGO; ASSISTANT IN OPHTHALMOLOGY IN RUSH MEDICAL COLLEGE.

(From the Pathological Laboratory of Rush Medical College.)

(With two text-figures.)

SINCE the publication of Wintersteiner's<sup>1</sup> book, *Das Neuroepithelioma Retinae*, considerable attention has been paid to the rosette figures on which, principally, was based the suggestion of the name neuroepithelioma for the malignant retinal tumor usually designated as glioma. Many articles have appeared on the subject of rosettes in retinal tumors, and lately the similar formations found in microphthalmic eyes have been frequently described. A few months ago Murakami,<sup>2</sup> working in Professor Schnabel's laboratory with Wintersteiner, found rosette formations as a result of a pure inflammatory process—a finding which, as he says, has not been described before. Recently I found most beautiful rosettes in an eye enucleated because of an acute inflammatory process. This finding and the general interest of the subject lead me to present this article.

For the tissue, on which this study is principally based, I am indebted to Dr. T. A. Woodruff. He is unable to give any clinical history of the case, as it was one that he saw a long time ago at a dispensary. He only remembers that the patient was a man of thirty-five or forty years of age. The label on the bottle has the clinical diagnosis, kerato-irido-cyclitis.

The enucleated globe, when it was given to me, to all outward appearance was normal except for a grayish haziness in the centre

of the cornea. It was in a 10-per cent. watery solution of formalin. The globe measured 25 *mm* in the antero-posterior diameter and 24 *mm* in the cross and vertical diameters. From the formalin solution it was transferred to alcohol of ascending strengths, and finally divided in the antero-posterior diameter. One-half was embedded in celloidin and sectioned. Sections were stained by hæmatoxylin and eosin. An attempt to stain by Mallory's neuroglia method was a failure, except that it stained all fibrous tissue very distinctly.

Macroscopic examination of the unsectioned half shows the anterior chamber to be shallow, the lens being dislocated forward. The vitreous is full of bands, which run fore and aft, and which are attached anteriorly in the region of the ciliary body and posteriorly to the retina. The retina is in place, except at the posterior pole of the eye, and apparently the detachment is caused by the pulling of the bands in the vitreous. There is blood in the vitreous, particularly posteriorly. Back of the detached retina—between it and the choroid—there is a grayish exudate, which does not show any fibrous bands or blood.

Histologically the cornea is disintegrating, and intensely infiltrated with leucocytes. At its centre the ulcer has perforated and Descemet's membrane is curled up in the exudate in the anterior chamber. The superficial blood-vessels at the limbus are engorged. The anterior chamber is filled with a mass of darkly stained material (with the eosin-hæmatoxylin), which contains innumerable leucocytes, particularly of the polymorpho-nuclear variety. The iris is adherent to the cornea at the angle of the anterior chamber, and at the pupillary border the pigment layer of the iris is ectopic—alternations which cause one to suspect that the eye was glaucomatous. The iris is made up of dense connective tissue, the result of former iritis; the muscle fibres have disappeared; the vessel walls are very much thickened. It is adherent in places to the lens capsule. It also is infiltrated with leucocytes, and the vessels are engorged. The ciliary body and processes are a mass of dense, congested connective tissue; from the body the muscle fibres have completely disappeared. The processes in places are lined normally by cells, in others the cell lining is absent. The remaining cells are swollen and broken up. The region of the zonula is very interesting in the development of blood-vessels and new connective tissue, which has taken place here. The vessels of this new tissue can be traced to their



origin in the ciliary processes. The region is very œdematous and contains many erythro- and leucocytes. The zonula fibres are greatly pulled apart and backwards by the shrinkage. The lens is cataractous. At the anterior pole the cells have multiplied and become fibrillar. At the cortex the fibres show degenerative changes. The nucleus is normal.

The retina anteriorly shows the changes which are ordinarily described as cystic. In this region the internal limiting mem-



FIG. 1.

SHOWING FOLDS IN THE RETINA. *a*, INTERNAL NUCLEAR LAYER ;  
*b*, EXTERNAL NUCLEAR LAYER ; *c*, EXTERNAL LIMITING MEMBRANE ;  
*d*, ROSETTE FORMED BY A FOLD.

brane is well defined, and the fibres, which are preserved and cause the cystic appearance, terminate in this membrane at their inner end; at their outer end these fibres appear to terminate in nucleated cells, which are intimately in contact with the pigment-cell layer of the retina. These long fibres look like the neuroglia fibres of Müller. Towards the equator of the globe the retina is greatly changed. Resemblance to the normal structure is maintained only by Müller's fibres (which appear to be even increased



in number, but which probably, as is the case in pathological processes, only stand out more prominently by reason of the disappearance of less stable structures), and by the persistence of the external nuclear layer and the external limiting membrane. The rods, cones, and ganglion cells have disappeared. Along the inner surface blood cells are found in masses which indicate extensive hemorrhage, and there is hemorrhage within the retina. In this region, in places, it remains attached to the choroid; at other places it is loosened.

A little back of the equator the retina is completely detached,

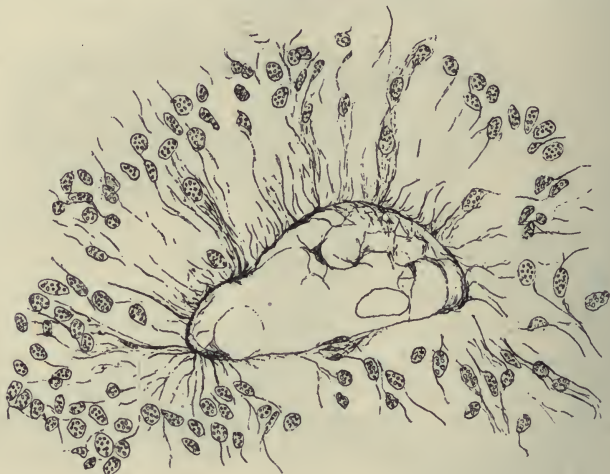


FIG. 2;  $\times 1000$ .

A ROSETTE STAINED WITH MALLORY'S NEUROGLIA STAIN.

except at the papilla. It shows the change spoken of in the foregoing paragraph—the neuroglia tissues are preserved, the nerve fibres and cells have disappeared. Here, in a region included in a circle of about one-fourth of an inch, with the nerve as a centre, the retina shows a most striking picture—namely, beautiful rosette formations (see Figs. 1 and 2), and the very interesting fact is that these formations are clearly the result of infoldings of the retina. This part of the tissue is œdematous, and there is an accumulation of blood cells. Near the optic nerve there appears to be a development of new neuroglia tissue. This new tissue is particularly noticeable at the papilla where it fills up the depression formed by the backward bending of the fibres of the lamina cribrosa. This depression is a further indication that the eye was

glaucomatous, and lends weight to the view that probably the corneal ulcer and the resultant acute process was a sequel to the glaucoma.

The optic nerve is atrophic. The choroid is shrunken and atrophic. The vitreous chamber is filled with blood serum containing more or less blood cells, and fibrous bands are running fore and aft through it.

Summing up the foregoing findings, it may be said that we have a globe in which an acute general inflammation has followed an old irritative process; resulting, no doubt, from the old process, the less stable structures—*e. g.*, the rods and cones—have disappeared, while the fibrous structures—*e. g.*, Müller's fibres—have persisted, and even appear to be increased. In the midst of these changes occur the interesting rosettes.

As to the origin of the rosettes and similar figures, there can be no question. To repeat, they are clearly due to folds in the retina, which were probably caused by shrinkage of the bands in the vitreous.

If such rosettes may be formed in this way by folds of the retina, an interesting question is, Why have they not been described before?

Before undertaking to answer this question, there are two facts that must be considered: In the first place, the rosette formations of retinal tumors, particularly such as are shown in the specimen of Emanuel,<sup>6</sup> have not been studied frequently; secondly, when the retina forms such folds, the resemblance to rosette formations may be very indistinct. It will be remembered that, in the specimen described above, the condition of the retina—the disappearance of the nervous tissues proper and the persistence of neuroglia tissue—makes it possible for this specimen to show the rosette formations unusually perfect. Considering these facts, the idea suggests itself that similar folds and formations have been seen frequently, but their resemblance to the rosette formations of tumors has not been appreciated, and herein I believe lies the answer to our question.

Bearing in mind the idea that such formations not infrequently exist, I have looked over my histological sections.

The result was as anticipated ; for in several specimens very distinct rosettes were found, and I venture the opinion that rosette formations in pure inflammatory processes hereafter will be observed frequently.

For further support of my view of this question, I have looked through recent literature for pictures of similar formations and the interpretation of them. We do not have to go farther back than the *New York Eye and Ear Infirmary Reports* for 1900, in which Fridenberg<sup>3</sup> describes such formations, with illustrations, in a study of a degenerated globe. He speaks of them as cysts, and does not intimate that they have any resemblance to the rosettes of tumors.

Such findings as we have in this specimen, I venture to believe, have an important bearing on the discussion of the subject of the make-up of rosettes, for here we have rosettes the lining wall of which, without doubt, is the external limiting membrane. And the question at once arises as to the identity of rosettes of inflammatory origin and those found in retinal tumors.

The first intimation that the rosettes of tumors and those sometimes found in microphthalmic eyes are similar comes from Wintersteiner,<sup>4</sup> who, in the study of a microphthalmic eye and its rudimentary retina, found rosette formations, which he says are perfectly analogous to those found in retinal tumors. A recent confirmation of this finding is by Dötsch.<sup>5</sup> In a study of a microphthalmic eye, he found rosettes which had a great similarity to those described by Wintersteiner in tumors, the one essential difference being that the rosettes that he found were larger than those described by Wintersteiner; but he says: "Trotzdem glaube ich, dass wir es mit Gebilden ganz analoger Natur zu thun haben." Murakami,<sup>18</sup> in his study of the rosettes due to inflammatory changes, says: "Die Rosettenbildungen der Neuroëpithelialschicht in unserem Falle sind der Form noch analog derjenigen, welche von vielen Autoren bei Microphthalmus und Glioma retinae, ferner bei Conus nach innen-unten, beschrieben sind." It was my good fortune to be at work in Prof. Leber's laboratory when Dr. M. Wiener was studying the tissue afterwards described by Dr. Carl



Emanuel,<sup>6</sup> and I am the possessor of a couple of sections of this tumor, of which it is said: "Die Rosetten finden sich bei uns in grossen Mengen." It is interesting to compare this tumor tissue with that of my sections. The striking feature is the great similarity of the rosettes. From this comparison, we can only confirm the findings of Murakami, and say that these rosettes—the result of folding of the retina—are analogous to the rosettes that have been found in tumors and in cases of microphthalmus.

The fact that the wall of the lumen of the rosettes of my specimen is the external limiting membrane confirms the views of Wintersteiner<sup>7</sup> ("Die Glänzende, dem Lumen der Rosette, respective der Concavität des Bogens, zugewandte Linie entspricht der Membrana limitans externa"), and this brings us to the conclusion that I believe this specimen particularly points out, *i.e.*, that the rosettes of tumors are made up of cells which may form neuroglia—external limiting membrane. The bearing of this fact on the discussion started by the introduction of the term neuroepithelioma is immediately evident. If these cells form neuroglia, the tumor made up of them is, according to our present nomenclature, a glioma.

There is little question of the character of the external limiting membrane. All the text-books speak of it as neuroglia tissue, and confirming this is its reaction with Wiegert's special stain, as has recently been demonstrated by Pines.<sup>8</sup> I have confirmed this finding in tissue which I succeeded in staining with Mallory's neuroglia stain.

This demonstration of the nature of the rosettes in the specimen described in this article, bears out the conclusion that I<sup>10, 11</sup> arrived at in a recent study of a retinal tumor. In the sections of this tumor, I succeeded in staining rosettes by Mallory's neuroglia stain, and on that reaction I based the conclusion that such retinal tumors originate in neuroglia. Two statements in the article referred to I must change. In the rosettes of the tumor I thought the lumen corresponded to the internal limiting membrane and the radiating fibres to the neuroglia fibres terminating in the internal limiting membrane. In the light of the folded



retina, I would rather say that the wall of the lumen of the rosettes corresponds to the external limiting membrane (as Flexner<sup>9</sup> and Wintersteiner said), and the fibres terminating in it to the neuroglia fibres normally terminating in the external limiting membrane. There is also good ground, however, for the view that rosettes may be formed in which the wall of the lumen would correspond to the internal limiting membrane.

It may be permissible to mention briefly that the conclusion that the rosettes are neuroglial in character is much more in harmony with the general teachings of pathological anatomy and is more nearly what we would expect, from the findings of similar rosette formations in gliomas arising in the brain, than the suggestion that these formations are made up of cells which form rudimentary rods and cones.

Retinal tumors with rosette formations may be classed as histioid tumors—tumors in which one or another tissue is more or less faithfully reproduced. It is a recognized fact that histioid tumors are essentially benign. These facts, with the further fact that gliomas of the brain in which rosette formations are found are not malignant tumors in the sense that carcinoma and sarcoma are,—*e. g.*, they do not form metastases to other organs or cause cachexia like sarcomas or carcinomas,—are food for interesting speculation. The question immediately presents itself, Are the retinal tumors with rosette formations less malignant than those without such formations? Or, putting it another way, Is the retinal tumor with rosette formations an exception to the general teaching that retinal tumors are highly malignant? Unfortunately, with the material at hand, this question cannot be answered. However, the case of Emanuel,<sup>12</sup> which was most thoroughly studied, is suggestive. The eye was blind and inflamed when the child was three years old; at five and one-half years of age the patient was taken to the Heidelberg Clinic and the eye was enucleated; four years later it was noticed that the child had been perfectly well since the enucleation. This history shows that in this case, in which rosettes were a most prominent finding, the tumor was not of a highly malignant type; and

the comment may be made that many a retinal tumor has had such a chronic course, the patient recovering perfectly after its removal, while the histological description does not mention rosettes. But the comment could also be made that, maybe, in these cases of chronic course and recovery after removal, the histological type of the tumor was similar to that of the case described by Emanuel, for we well enough know that it is only since the exhaustive work of Wintersteiner (1897) that the rosettes of gliomas of the eye have been properly recognized. But, as before stated, this question can only be a matter of speculative interest now. Even in the relatively few recorded cases of retinal gliomas with rosettes, the subsequent clinical history is very incomplete. Of course, these considerations are only of pathological and prognostic interest—the treatment of these tumors is not affected.

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## CYTOTOXINS AND SYMPATHETIC OPH- THALMIA.

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IN the light of results that are being published almost every week, it seems safe to venture the opinion that the discovery of what is known as "Pfeiffer's reaction" will be one of the landmarks in the history of medicine, and the beginning of investigations that may have the most far-reaching results in our science.

By way of review, it may be pointed out that Pfeiffer immunized a guinea-pig against the vibrio of cholera by repeated injections—made at intervals of a few days—of cultures of this organism. Into the peritoneal cavity of such a prepared guinea-pig Pfeiffer injected living cholera vibrios. From time to time, at intervals of a few minutes, he withdrew from the peritoneal cavity small amounts of the peritoneal fluid containing the organisms. By examination with the microscope the withdrawn bacteria were found to have undergone changes. Pfeiffer found that living motile bacteria when put into the peritoneal cavity of an immunized guinea-pig almost immediately lost their motility, in a few minutes they became swollen and underwent a granular degeneration, and very quickly were entirely destroyed ("Pfeiffer's reaction" or "phenomenon").

The bearing of this phenomenon on the suggestion that I have to make begins with the work of Bordet.<sup>1</sup> His work



consisted in the study of the known fact that if rabbits' blood corpuscles be injected into a horse, the serum of such a horse develops poisonous properties towards rabbits. And the question naturally arose as to what happens if other kinds of cells are injected into the bodies of animals of different species than those from which the cells are derived. Emulsions of the testicle were injected into the peritoneal cavity of such an animal as the guinea-pig. After some days the blood serum of the prepared guinea-pig develops the capacity of immobilizing fresh spermatozoa of the kind used in the injection. And experiments were made with white blood corpuscles, with emulsions of spleen, bone marrow, etc., and now we have all sorts of cytotoxins gotten by such injection experiments. It will be observed that the toxins obtained in this way are heterotoxins—*i. e.*, produced in animals of different species.

Then came experiments in the production of isotoxins—toxins produced in similar species. Nefedieff<sup>2</sup> ligated one ureter in various rabbits, and several weeks later injected serum from such animals into the ear vein of healthy rabbits. These experiments, of course, were based on the idea that ligature of the ureter may lead to the accumulation of toxic material in the organism. The injected animals developed albuminuria. In one rabbit with albuminuria, which was killed on the seventh day, the kidneys showed marked degenerative parenchymatous changes, with some intertubular round-cell infiltration. Other isotoxins have been found. For instance, Hulot and Ramond<sup>3</sup> have produced parenchymatous degenerations in the liver of guinea-pigs by the injection of suspensions of liver cells of guinea-pigs. Of particular interest to us is the work of Castaigne and Rathery,<sup>4</sup> who, in rabbits subjected to ligature of the renal artery, the ureter, and the entire pedicle of the kidney, found more or less well-marked degenerative changes in the opposite kidney; while in the case of unilateral nephrectomy, these authors found no histological changes in the opposite kidney. To repeat (accepting the experiments quoted above): (*a*) blood serum from a rabbit with one ureter ligated, injected into the blood of other rabbits, causes in the kidneys degenerative



parenchymatous changes; (*b*) ligation of the ureter, the renal artery, and the entire pedicle of the kidney causes more or less well-marked degenerative changes in the opposite kidney; (*c*) unilateral nephrectomy causes no histological changes in the opposite kidney. The logical conclusions from these experiments are that the toxins are in the blood, and that these toxins owe their origin to degenerations which have taken place in an injured kidney.

If these conclusions may be accepted, it does not take a far fly of the mind to suggest an hypothesis for the causation of that unexplained, miserable condition that sometimes confronts us—so-called sympathetic ophthalmia. And I venture to suggest that it may be given to some fortunate experimenter to demonstrate that when a damaged eye degenerates in the orbit, the cells of the eye (probably the lining cells of the ciliary processes and the iris) can give rise to a specific cytotoxin, which, circulating in the blood, picks out the cells of the fellow eye, and may cause changes which we now designate as sympathetic ophthalmia.

The above considerations prompted me to the following experiment, with the hope that I might get a heterogeneous toxic serum for eyes. On January 3d, three dogs were killed, and immediately the eyes were enucleated. The enucleations were done under as cleanly conditions as possible, and as they were taken out they were washed in boiled water and put into Petrie dishes. Each eye was divided into halves at the equator. From the anterior half the vitreous and lens were removed (the posterior capsule of the lens was divided by a cross-section, and the lens was removed by expression). After the six anterior halves of the eyes were thus gotten, they were put in a sterile mortar, containing a small amount of normal salt solution and a small amount of sterile sand. The whole mass was pounded, and thus an emulsion was made of the cells of the ciliary processes, ciliary body, and iris. This mixture was allowed to stand for about an hour, and the clear fluid taken up into sterilized glass pipettes for the purpose of allowing further settling, and the resulting clear fluid was injected by means of a sterile syringe into the peritoneal cavity of a healthy

goat. Seven days later, on January 10th, this process was repeated, using four eyes. On January 17th, a mixture from six eyes was injected into the goat, and on January 24th, six more eyes were injected. On February 5th, blood was taken from one of the large veins of the neck of the prepared goat. This blood was allowed to coagulate, and, on the following day, the serum (3cc per kilo of dog weight) was injected into a vein of a normal, healthy dog. At the same time, a normal goat was bled, and a similar amount of serum was injected into a control dog. On February 8th, emulsion from six more eyes was injected into the goat. On February 11th, both dogs that had been injected with goat serum were killed, and the eyes enucleated and put into formalin for twenty-four hours, and later into alcohol. On February 21st, two weeks after the last injection, more serum was collected from the goat and injected into a dog (3cc per kilo). The eyes of the dog were watched carefully for clinical symptoms, but none appeared. It may be said that two days after the injection there was a little redness of the eyes, which aroused some interest. It, however, promptly disappeared, and, in all probability, was due to some accidental irritation. Four days after the injection of the dog with the serum, the dog was killed, and the eyes put into formalin for twenty-four hours, and later into alcohol of ascending strengths.

After proper preparation, these eyes were imbedded in celloidin, sectioned and examined. There were no histological findings in the eyes of the dogs that got the toxic serum that differed from those of the other dog.

Unfortunately, these experiments lend no weight to the theory suggested, but it also may be said that they do not disprove it. Further experiments must be made. The lines along which experiments should be made will suggest themselves. Possibly I did not, in the selection of a goat and dogs, pick the proper animals for the production of a heterogeneous cytotoxin for eyes; maybe I did not introduce enough material, and maybe I did not continue the injections into the goat long enough. An interesting experiment suggests itself to me, and I am waiting for an

opportunity to try it, viz., the injection of blood serum from a patient suffering from sympathetic ophthalmia into the blood of a monkey.

It is a great temptation to point out the harmony of this theory with the clinical findings in sympathetic ophthalmia, and when the theory is viewed in the light of these findings some very interesting facts and ideas present themselves, but it does not seem proper to go further into the subject here.

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## ON CONGENITAL CYSTS OF THE EYEBALL AND THEIR DEVELOPMENT.

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(With ten figures on Plates I.-II., *Arch. f. A.*, XLI.)

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by Dr. WARD A. HOLDEN.

THE lively interest in the subject of the development of congenital deformities which has been shown in many articles published in the last few years leads me to report briefly on some cases, in part examined long ago, which seem to me to be of value from various points of view.

CASE I.—The pig's eye to be described (Figs. 1-3) was sent to me by Dr. W. Asher of Leipsic. It was of nearly normal size (corneal diameter 12mm, sagittal axis 20mm), the anterior chamber of medium depth, the pupil round and large. In the fundus were to be seen several grayish-white stripes resembling detachment of the retina. In the lower portions of the fundus was a large pure white reflex.

A cyst lay beneath the eyeball, in volume about double the size of the eye. Its greatest breadth was 35mm, its sagittal diameter 20-25mm, and it was divided by an antero-posterior constriction into a larger right portion and a smaller left. The cyst wall was everywhere very thin and translucent, and filled with a clear liquid which communicated directly with the interior of the ball. Slight pressure upon the wall of the cyst increased the intraocular tension considerably and conversely pressure upon the ball rendered the wall of the cyst more tense. When the eye was held toward the light, by looking through the cyst the communication could be seen as a large round dark spot. The optic nerve was of normal size and entered the ball near the place of communica-



tion between ball and cyst. The wall of the eyeball, consisting of a dense fibrous pigmented sclera, here bulged backward and downward, and passed between the two halves of the cyst. After hardening in 10 % formol, the cyst was divided by a horizontal section corresponding to the line *a a* in Fig. 1. The upper half of the cyst with the adjacent portion of the eyeball seen from below presented the picture seen in Fig. 2. Between the interior of the eye and the cyst there was communication by means of two round openings separated by a connective-tissue septum which followed nearly the entire extent of the cysts, corresponding to the constriction observed externally. The two openings had fairly sharp margins and like a portion of the adjacent cyst wall were covered with dark pigment which passed over without interruption into the retinal pigment. The greater part of the cyst wall, however, appeared to have little pigment or to lack it altogether. The cyst wall passed directly into the sclera of the adjacent portion of the ball.

The retina in the interior of the eye was partly detached and lay slightly folded in the vitreous chamber. At the points of communication some folds of retina passed into the cyst cavity for  $1-1\frac{1}{2}mm$ . Even macroscopically the retina could be seen to be defective at these points.

The ball was then divided at the equator by a frontal section corresponding to the line *b b* (Fig. 2) into an anterior and a posterior half. The section (Fig. 3) passed through both openings between the ball and cyst. The septum described above as separating the two openings here appeared as an irregularly triangular formation  $1-2mm$  in diameter. In the opening to either side of it were numerous folds of retina. In the anterior half of the ball the normally formed lens was found in its normal location. The ectatic part of the wall of the eyeball scarcely reached the ora serrata anteriorly, so that the ciliary body and neighboring parts appeared normal. The optic-nerve head seen in the posterior half of the ball appeared normal.

The microscopic condition, in so far as it was of interest in explaining the development of the malformation, was as follows: The retinal pigment epithelium could be followed through the openings, and continued as the lining of the cyst wall. The latter showed much the same changes that I described in a similar case in a human eye.<sup>1</sup> From the epithelium of a single stratum

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<sup>1</sup> *Arch. f. Ophth.*, xlii., 3, p. 214.

developed gradually a many-layered epithelium of elongated cells, which in varying thickness lined the cyst lying directly upon the scleral wall, no choroid being visible. On the whole, the changes in the pigment epithelium were less here than in the case described previously. The septum everywhere had the character of scleral tissue and was covered with the same altered epithelial layer. The posterior end of the septum passed directly into the sclera just below the optic-nerve head. The retina, in general, exhibited no particular changes. It could be followed through the openings a short distance into the cyst. The ampulla-formed bulging just beneath the optic nerve proved to be a so-called coloboma of the optic nerve, which will be described in detail with other cases at another time. The retina in this bulging part was stretched and contained an excess of connective-tissue elements. I could not satisfactorily determine whether there had been a closure of the secondary optic vesicle in its entire extent, or whether, as in the two cases following, it had not closed in its entire extent. Some sections of the series made it seem probable that here also there had been a lack of closure for some distance at least.

CASE 2.—The pig's eye with a malformation now to be described was sent to me by Dr. Rosenthal of Ascherleben. The eye, some hours after the animal's death, was put into bichloride solution 1:2000, then in a 1:200 solution, and then into alcohol. The cornea had about the form of an equilateral triangle, and its diameter in the middle was about 7-9mm. The axis of the ball was about 20mm long. In Fig. 4, *a* and *b*, is seen the peculiar form of the eye. At the equator were two flat lateral ectasias, and there was a third similar one above. Directly downward was a cyst divided by a constriction into two unequal parts, 8mm high and 15mm broad, similar to that found in Case 1. The optic nerve entered the ball just above the cyst. The sclera of the entire eye was thinner than that of the normal pig's eye and in the region of the cyst it was thin and transparent. After dividing the hardened eye by an equatorial section, the anterior segment seen from behind presented the picture shown in Fig. 5. The cyst communicated with the ball through an opening about 7mm wide. Through the middle of this opening ran from behind forward a small round filament 1mm in diameter, with a small dark spot in the middle. About the middle of the cyst wall ran a slight elevation corresponding to the externally visible line

dividing the cyst in half. The retina ran continuously over the opening of communication in these sections. Whether there was a break in the retina in the posterior half of the ball could not be definitely made out on account of the imperfect preservation of the specimen.

The microscopic examination showed a continuous extension of the retinal pigment epithelium over the inner surface of the cyst wall. The changes in the epithelium were less marked than in the first case, in that over considerable areas a slightly pigmented epithelial covering lay directly upon the sclera. In the wall of the cyst here no trace of choroid was to be seen. The narrow filament extending through the opening of communication had a typical scleral character. The black point in the middle was due to pigment, such as is found in the normal sclera of the pig. From the end of the scleral filament fibres ran slightly divergent to the capsule of the lens.

The significance of this peculiar condition will be made plainer when we consider the changes to be described in the third case. We must suppose that the fibres represent the remains of the connective tissue which passed through the foetal ocular cleft and at the corresponding point prevented the closure of the cleft for a short distance. This will be alluded to later.

These two cases of malformation are characterized in general as follows: The development of a large cyst downward from the ball with a corresponding thinning of the sclera in eyes of fairly normal size; the division of the cyst by a well-developed septum lying near the median line; a large opening of communication between cyst and interior of the ball, in both cases divided into lateral halves by a median scleral tract corresponding to the septum; lining of the cyst wall with pigment epithelium which near the openings of communication passes over into the pigment epithelium of the retina; absence in the cavity of the cyst of the retinal tissues developing from the inner layer of the secondary ocular vesicle. In one case the retina was distinctly interrupted at two points. In the second case it was evident that the closure of the cleft in the secondary optic vesicle had not been completed anteriorly because of the presence of tough fibres connecting the scleral stalk with the inferior margin of the lens.



CASES 3 AND 4.—The two eyeballs to be described had no cysts but there were malformations which help to explain the conditions found in the preceding cases. They were sent to me by Dr. Krückmann of Leipsic, who obtained them from an infant that died in birth. They were removed immediately and fixed in formol, and hardened in alcohol.

The left eye exhibited the following conditions : The ball was of normal size and color, the cornea clear, the anterior chamber of medium depth. In the iris was a broad coloboma downward, ending in a point at the root of the iris. The eye was opened by a horizontal section above the plane of the optic-nerve entrance. The appearance of the lower half is shown in Fig. 6.

Macroscopically the optic-nerve entrance appeared normal. About 1mm beneath it was the posterior margin of a nearly circular coloboma, almost white and free from pigment, 13mm in diameter. This extended anteriorly almost to the ciliary body, which presented peculiar conditions. The ciliary processes were not joined inferiorly to make a complete ring, but it seemed as if their junction had been prevented by a fine septum and that they had developed along this posteriorly to an abnormal extent. The lens was in position and of normal shape. The condition of the vitreous was interesting. Examined macroscopically, the upper two-thirds were of normal appearance, but a portion 6mm high and 13mm broad just above the coloboma was almost completely wanting. In place of it was a number of fine fibrils or incomplete septa which passed out radially from the middle of the coloboma. The retina everywhere lay in apposition to the choroid.

The condition of the right eye was as follows : It was smaller than the normal, being 15.5mm long, equally broad, and 13.5mm high. In the iris was a broad coloboma downward, narrowing toward the root of the iris. In the lower half of the ball was a broad coloboma of the choroid, which anteriorly presented the same strange conditions found in the other eye. But posteriorly it differed from the other eye in that the coloboma extended beyond the disc. The greater part of the coloboma was not ectatic, so that the ball generally preserved a normal shape. Only close to the lower margin of the nerve head, corresponding to the passage of the optic-nerve sheath into the sclera, was an ampulla-like ectasia downward and backward, 3-4mm in each diameter. The lens was normal in shape and location.



I wish to describe briefly a third eye similar to these two, given to me by Professor Sattler. It was obtained at the autopsy on a man of thirty-five and its lower half is pictured in Fig. 7.

The unopened eye presented a small coloboma of the iris, and a well-marked ectasia and thinning of the sclera 15mm in diameter and of nearly spherical shape, including the nerve head and extending forward beyond the equator. The greatest height of the ectasia above the normal sclera was 7-8 mm. After opening the eye by a horizontal section the lower half presented the picture shown in Fig. 7. In the inferior periphery of the lens downward were two small depressions. The ciliary body exhibited the same changes as in the two cases just described. Corresponding to the external ectasia was a large coloboma of the choroid extending beyond the macula. The nerve head appeared oval, deeply excavated, and was divided into two equal parts by a fine vertical furrow. A rudimentary hyaloid artery extended a short distance into the vitreous.

All three eyeballs were stained in toto in alum-carmine and cut in serial sections.

The following points in the microscopic condition of these three eyes are worthy of notice.

A frontal section near the ciliary body in Case 3 is represented in Fig. 9. The cleft in the secondary optic vesicle had not closed on account of a short connective-tissue process which passed from the sclera 1-3mm into the vitreous and here broke up into a number of fine fibrils. Close to this process lay the points of folding of the inner layer of the secondary vesicle back into the outer layer. The two folds lay 1-3mm apart. The transition of one layer into the other followed here in a typical, regular way. The outer layer consisted of a regular single stratum of epithelium. It is evident that no morbid process interfered with the growth of the ocular proton preventing the junction of the margins of the cleft, the cause which has been assumed to exist in cases of similar malformation. The growth of the proton was sufficient to bring the two margins together, as is shown by the fact that near the point of reduplication considerable folds of the retina were present. A glance at Fig. 9 will show that there was sufficient

retina to effect a junction and that this had been prevented by the mechanical obstacle—the scleral process.

Quite a different condition is found farther back at a point corresponding to the greatest breadth of the coloboma (Fig. 10). To save room I have here represented only the parts bordering the coloboma laterally. The middle part, corresponding to the break in the drawing, shows the same histological features as are represented in the middle part of the drawing. Here the foetal cleft had closed completely, but at this place and near it the retina was greatly thinned and for a considerable distance appeared only as a fine connective-tissue membrane. The outer layer of the secondary vesicle was pigmented nearly to the coloboma and then continued as a single stratum of non-pigmented cells. Choroïdal tissue was completely wanting in almost the entire extent of the coloboma.

Fig. 8 shows the condition of the optic nerve with the short persistent hyaloid artery and the condition of the retina in the portion of the coloboma near the disc. The two other cases exhibit practically similar conditions so that I shall omit a special description of them. The histological relations of the coloboma of the nerve are of little interest in respect of the questions under consideration and will be discussed elsewhere.

The particular interest in the case last described lies in the fact that it shows in a clear and typical way the results of the mechanical interference with complete closure of the anterior portion of the foetal cleft, while the posterior portion has closed, but the overlying retina is here a delicate thin membrane only. These changes, as well as those in the vitreous (in Case 3) are fundamentally different from those which we are accustomed to find after inflammatory changes in the eye. The continuation of the connective-tissue tract into the vitreous renders comprehensible the connection between the scleral stalk and the inferior margin of the lens in Case 2.

The development of these cystic formations (Cases 1 and 2) in the light of the cases previously published by me would seem to be most readily explained as follows: The

invagination and the closure of the secondary optic vesicle took place in a fairly normal manner. In the region of the closure a portion of the bulbar wall had so little resistance that after the closure it yielded to the intraocular tension and became greatly distended. The outer layer of the secondary vesicle followed this distension and lined the inner surface of the cyst wall, exhibiting various changes, such as I have described in cases previously reported.

The inner, readily ruptured, layer of the secondary vesicle showed in the first case an interruption of continuity at both the places corresponding to the greatest distension, so that the cavity of the cyst communicated directly with the vitreous cavity. In the second case a similar break doubtless existed, although this could not be shown definitely. The comb-like ridge, which in the first case was well developed and passed along the middle of the entire wall of the cyst, and in the second case was only indicated, corresponded to the region of the foetal cleft. The marked development of such a ridge is well known by reason of many clinical observations and many pathological findings even in malformed eyes in man. No particular proof is required that the fine tract which in each case ran from the lower margin of the nerve head to the inferior margin of the lens was of the same genetic origin.

The question now arises whether this explanation is sufficient to account for the development of these malformations or whether there may not be other possible explanations. In the beginning we must find whether the conditions can be referred to an extension of the primary optic vesicle, an explanation which has been offered to account for the production of various congenital cysts. In general this explanation does not seem to me plausible, since in the great majority of the cases that have been carefully examined the cysts have lain downward from the eye and have been in the closest connection with the line of closure of the cleft in the secondary vesicle. In some cases cystic bulging of the walls is found at some other point, the sclera being thinner than normal. If the cysts arose from a protrusion of the primary vesicle before the secondary vesicle was



formed, it would be difficult to understand why the protrusion should occur nearly always at the site of the cleft in the secondary vesicle, for we know that all portions of the primary vesicle are equally resistant.

In regard to the old theory that a foetal sclero-chorio-retinitis is the cause of these malformations, I have been convinced by the examination of a number of microphthalmic eyes with coloboma that in many there are no indications of a recent or an old inflammation; I have stated that the supposition of slight individual differences in the development of the mesodermic tissues entering the vitreous chamber through the foetal cleft is supported by many facts and by many analogies in general histology, and that it permits us to explain these malformations in a relatively simple way.

It is well known that in place of the vitreous there may be formed varieties of tissue which according to our histogenetic conceptions are doubtless of mesodermic nature and are not the result of inflammation. Thus, for example, cartilage and fat have been found frequently in place of the vitreous. The view previously expressed by me that in such cases there was an atypical development of mesodermic tissue in an early embryological period has been accepted recently by many investigators. Even if the presence of pure connective tissue in these cases were the result of chronic inflammation, no inflammation would account for the presence of fat or cartilage in the vitreous, and one is obliged to assume an atypical development of mesodermic tissue.

The appearance of slight individual variations in the development of two adjoining tissues is of every-day occurrence. If we call all changes which directly or indirectly lead to disturbance of function in an organ "morbid," so must the same process, which in one case produces only a harmless variation, in another be designated as distinctly morbid. It is evident that the old theory of so-called "simple check in development" does not satisfactorily explain such malformations as microphthalmus with coloboma. The idea that a foetal inflammation was the chief cause,



generally held fifteen years ago, is now mostly given up. On the other hand, the view has again become prevalent in another form that inflammation plays a rôle in the development of malformations — in the supposition that there is a general disturbance influencing the growth of the whole eye and preventing the approach of the margins of the foetal cleft. My remarks were confined to the group of cases in which careful microscopic examination revealed no evidences of present or past inflammation. In numerous cases there has been found no evidence whatsoever of a diffuse inflammatory process. The explanation of these malformations as being due to individual variations appears to me simpler and more plausible than to assign them to a hypothetical inflammation of unknown cause running a latent course.

An example of another group of malformations may be described briefly. I once examined a small chicken embryo of five days' development in an incubator, in which one eye so far was normally formed and the other was wanting, while the entire brain otherwise was normal. I stated that the supposition of an inflammation here was not only not proved, but was absolutely to be excluded, for one could not conceive of an inflammation severe enough to have produced this effect and yet leaving no trace at the fifth day of incubator existence in the very delicate embryonic tissues.

Although this malformation does not belong in the same category with the others, it yet proves that the most marked developmental anomalies may occur without any inflammation; the hypothesis of inflammation here fails completely. A similar disturbance would seem particularly to fit the cases of pure microphthalmus, *i.e.*, cases of eyeballs small in all dimensions without coloboma. But if in explanation of this malformation one assumes anomalies of the formative effort either in intensity or in quality, the assumption of a similar anomaly of formative effort cannot be excluded in respect to the mesodermic tissues entering the vitreous cavity. A slight increase in the intensity of this formative effort could lead to a disturbance of closure of the cleft in the secondary optic vesicle.

The malformations in question have a considerable tend-

ency to be transmitted by inheritance. The inheritance of an inflammation is not to be thought of, but physiology and pathology offer us numerous examples of the inheritance of individual variations, although their ultimate cause is unknown to us.

My views previously expressed in regard to the rôle of inflammation in the development of malformations have not been altogether correctly quoted, so I quote verbally from my first communication of about thirteen years ago: "Although I have no doubt that a number of the cases of microphthalmus which are supposed by the authors to be due to inflammation are really to be explained in the manner I have pointed out, yet I am far from questioning the effect of an intra-uterine inflammation and its results upon the development of the eye."

*Explanation of the Figures.*

Fig. 1.—Case 1. Ball seen from behind.

Fig. 2.—The same, after removal of the lower half of the cyst by a horizontal section corresponding to the line *a a*, Fig. 1, seen from below.

Fig. 3.—Posterior half of the same ball after it had been opened by a frontal section corresponding to the line *bb* in Fig. 2, seen from before.

Fig. 4.—Case 2. *A*, front view; *b*, side view.

Fig. 5.—Anterior half of the same ball, after division by a frontal equatorial section, seen from behind.

Fig. 6.—Case 3. The eye of a newborn child, lower half, seen from above.

Fig. 7.—The eye of a man of thirty-five, lower half, seen from above; beneath it the lower half of the lens with a coloboma.

Fig. 8.—Case 3. Sagittal section through the optic nerve (with remains of the hyaloid artery) and through the posterior end of the coloboma.

Fig. 9.—Case 3. Transverse section through the coloboma near the ciliary body.

Fig. 10.—The same case. Transverse section through the coloboma in the region of the equator. To save space the middle part of the coloboma is omitted since it shows changes similar to those in the lateral parts shown in the drawing.

## ASTHENOPIA DEPENDENT ON NEURASTHENIA AND HYSTERIA.

BY DR. H. GRADLE, CHICAGO.

ALL works of reference describe in detail the symptoms which may be produced by errors of refraction. But neither text-books nor most of the special articles in American periodical literature specify the conditions which determine the variations in symptoms. As a rule, the inexperienced reader is led to infer that optic imperfections may cause any one of a large array of annoyances in otherwise normal subjects. The present study, based upon a long experience in many thousands of instances, is intended to classify asthenopic symptoms according to their etiologic conditions.<sup>1</sup>

NORMAL ASTHENOPIA.—The minimum of annoyance which a healthy person complains of in consequence of an anomaly of refraction or an insufficiency of accommodation may be called normal asthenopia. If we select from a large experience those instances presenting the least degrees of annoyance, we will find that a variable amount of H., not rarely up to 1.5D, and exceptionally even to 3D, is tolerated without complaint until the accommodation proves insufficient for near work.<sup>2</sup> The time of life when such a degree of H. becomes perceptible depends upon the taxing of the eye for near work. It may be during school time; it may be much later in life. The same statement applies

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<sup>1</sup> Although these observations have all been recorded in my case-books, I do not think that a statistic presentation will teach as much or as correctly as a study of those individual cases which I have been able to observe best.

<sup>2</sup> Similar statements have been made repeatedly by St. John Roosa. The same facts have also been noticed in various statistic examinations of school children and of military recruits.



to low degrees of astigmatism, either Ash. or Asm. But while 1.5D of As. may not interfere with the utility of the eyes until long after puberty, any As. greater than 0.5D necessarily reduces the visual acuity, though not always to an extent of practical importance. When the lower degrees of H. and As. produce subjective disturbances, the symptoms are practically identical with those of presbyopia in the class of patients now under consideration, viz., those presenting the minimum of annoyances. As in presbyopia, it becomes difficult to maintain distinct sight for fine objects near the eye, especially in poor light. If the work is continued in spite of blurring, a tired feeling of the eyes results, which subsides gradually upon resting. In other words, in a certain class of persons, low and even medium degrees of H. and As. cause no symptoms except those of presbyopia far ahead of the presbyopic time of life of normal subjects.

On studying these persons from a medical point of view, we will find them, as a rule, perfect types of healthy humanity. But their number is not large in ophthalmic practice. Most of them go to the spectacle dealer rather than to the oculist. Occasionally we meet even with high degrees of ametropia which present no more subjective symptoms than those described. But such persons will admit that they have had this amount of annoyance as far back as they can remember, and in cases of this description the sight is always below normal, and hence, as a rule, close eye-work has been avoided.

THE EXAGGERATED ASTHENOPIA OF NEURASTHENIA AND ANÆMIA.—The majority of ametropes in private practice present a much larger array of complaints than those described. In comparison with the normal minimum of annoyance their asthenopia may be called exaggerated in three ways. In the first place, symptoms may be caused by a low degree of error which is entirely latent in subjects of the previous class of the same age. Secondly, the annoyance is more than a feeling of fatigue. It may be a real pain in the eyes, described as aching, smarting, or drawing, or the pain may extend in the form of headache. Dull feeling throughout the head, sometimes dizziness, occasionally even nausea,



may be complained of. Thirdly, the symptoms may not cease promptly upon resting the eyes, but may continue after close eye-work for hours, or be brought on even by efforts of distinct vision in the distance. There is, however, always some correspondence between the intensity of the symptoms and the amount of eye-work. When the patient complains of headache or other distress during rest of the eyes, or when such annoyances prevent sleep, they do not arise from ametropia. A single but positive exception to the latter statement must, however, be made, viz., with reference to "sick headaches." Periodic migraine depends in many instances on the cumulative effect of As., as shown by the positive curative influence of glasses in suitable cases.

Of the subjects with exaggerated asthenopia a large proportion are not in perfect health. Many are distinctly neurotic, as shown by the presence or former presence of functional neuroses, such as other forms of headache, chorea minor, habit-spasms, and other indications of an unstable nervous system. Not a few present the fatigue phenomena of typical neurasthenia in other functions as well. Quite often a history of family neuroses can be obtained. We encounter, however, not so often organic as functional nerve disease. It seems worth noting that alcoholism has figured very little in my records.

More frequent even than demonstrable nervous instability I have observed anæmia in these patients. It is probably the most frequent morbid condition found, either as chlorosis or as secondary anæmia. Anæmia, however, must be looked for by a blood count or examination of mucous surfaces (conjunctiva of lower lid, gums, and hard palate). Irrespective of the presence or absence of nervous instability and anæmia, it can be learned that many of this class of asthenopes have lived under environments bound to injure the health sooner or later. The most common pernicious influences I find to be indoor confinement and want of muscular exercise. Close use of the eyes is not an absolutely necessary factor, since clerks and saleswomen constitute a fair percentage of such sufferers; but, of course, an employee at desk work will notice the annoyance more than

those who only read during leisure hours. Occasionally less common injurious influences are recorded, such as lactation, loss of sleep, or worry. A noticeable factor, too, is the deleterious effect of some previous exhausting disease, especially influenza, sometimes measles. In a small proportion the co-existence of dyspeptic complaints is noted. Constipation is frequent enough, but probably only of minor and not constant etiologic importance.

The rôle of these various morbid conditions in exaggerating the effect of ametropia can be shown by the therapeutic result in suitable cases. Whenever we succeed in curing an anæmia or restoring the patient's general health by proper hygienic measures, we will find the symptoms of exaggerated asthenopia change to the minor annoyance normal to the degree of existing ametropia. Such a favorable result cannot be expected, however, in neurasthenia of long duration, in hereditarily neurotic individuals, or in patients who cannot escape their unhealthy environment.

These various observations can lead to but one inference. Whenever an ametrope complains of exaggerated asthenopic symptoms, we must infer that his nervous system is not in a normal condition, even if he presents no other evidence of it. This is true of a small number of such patients, but the more thoroughly we investigate the matter, the smaller becomes the number of instances of exaggerated asthenopia in apparently perfect health. In some of these apparent exceptions the lowered tolerance to ametropia, or monosymptomatic or localized neurasthenia, as it might be called, is a fairly constant, non-progressive condition, and when we relieve its manifestation by glasses we have done all that can be done. But in many others exaggerated asthenopia is the forerunner of a general breakdown of the nervous system, or its first indication. Proper medical or hygienic advice by the oculist can, in such instances, protect against subsequent ill-health.

ASTHENOPIA NOT DEPENDENT UPON AMETROPIA.—In 20 to 25 % of my patients complaining of asthenopic symptoms, the discomfort was not caused by any error of refraction or insufficiency of accommodation. There was either no

measurable ametropia, or the correction of existing small errors gave but insufficient relief, or none at all.<sup>1</sup>

In a small proportion of these cases (about 5 % of all asthenopes) the discomfort was started in a neurotic or ill-nourished subject, by a blepharitis or a low grade of catarrhal conjunctivitis. But neither exciting cause is at all common compared with the ordinary frequency of these lesions. Either blepharitis or an insignificant conjunctivitis will make the eye of a normal subject a trifle sensitive on prolonged use, but it requires an abnormal sensitiveness of the nervous system in order to have these affections interfere with ordinary eye-work by causing asthenopic distress. Rather more frequently than ordinary catarrhal conjunctivitis, I have found associated with the asthenopia of neurasthenics a slight inflammatory hypertrophy of the superior transition fold, mostly without mucous secretion. In some instances this lesion could be proven as the starting-point of the discomfort by the benefit of local treatment (nitrate-of-silver applications and the use of a suprarenal solution). But this lesion is often quite rebellious to treatment, while in other instances its etiological influence is obscured by complication with hysteria.<sup>2</sup>

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<sup>1</sup> On the basis of extensive observation, I cannot endorse the practice of many to correct every deviation from the emmetropic type. I find uncorrected hypermetropia of 0.5D irrelevant with the rarest exception in youthful subjects, and rarely of importance under the twenty-fifth year of life. Astigmatism of 0.5D is less often tolerated without annoyance than the same degree of H, especially if against the rule or oblique. Yet the proportion of instances in which 0.5D of As. is felt is exceedingly small compared with the common occurrence of this degree of imperfection. Half a dioptre of As. I have never known to produce what I have defined as normal asthenopia, except in connection with presbyopia. Whenever I have seen distress caused by As. of 0.5D it was always of the type of exaggerated asthenopia, and hence indicative of an unstable nervous condition. While I will not deny that in exceptional instances, even a 0.25D cylinder may give some relief, most of the cases I have observed of such low correction were either inconclusive or clear cases of self-deception on the part of the patient. I wish also to state explicitly that I base these descriptions entirely on cases without muscular disturbances. My observations and results have, however, led me to doubt seriously whether asthenopia can be caused by muscular anomalies which remain absolutely latent during ordinary use of the eyes, and can be demonstrated only by suppressing binocular vision through prisms or other artifices.

<sup>2</sup> In a small number of instances asthenopic discomfort may also depend on hypertrophic nasal catarrh with more or less stenosis or suppuration of a nasal sinus. But these patients, too, are all of the neurotic type and in many of them it is difficult to decide whether the asthenopia is the direct consequence of the nasal obstruction or a hysterical manifestation.



In about one per cent. of my asthenopic patients symptoms suggestive of a medium degree of ametropia were caused entirely by a pronounced anæmia. They were all girls or young women who had either perfect refraction, or who were at least not benefited by the correction of a minor error. In every instance in which the anæmia was cured the ocular symptoms and headache disappeared. But only a minority of them remained under my observation for a sufficient length of time to record their cure. Yet I have seen enough positive cases to be able to assert that even in emmetropia a high anæmia can lead to characteristic asthenopia upon use of the eyes.

In another class of cases I have observed intense asthenopic discomfort with an acute onset. They, too, were mostly, but not exclusively, girls, sometimes slightly anæmic, sometimes hitherto in alleged good health. Since a certain day or date they had experienced more or less steady discomfort in their eyes, usually with some dull headache, which symptoms increased so markedly upon using their eyes that work was almost impossible in spite of normal vision. These patients, besides, did not feel well. When seen within the first few days, they showed evidences of gastro-intestinal disturbance—furred tongue, capricious appetite, more or less lassitude, sometimes constipation, occasionally a febrile rise of temperature of half or one degree Fahrenheit. I have observed this condition in more than forty instances. The clinical study of these patients, and especially the therapeutic results, have led me to believe that the intestinal disturbance is the direct cause of the headache, ocular sensitiveness and discomfort. All those seen within the first week or so were entirely relieved of all symptoms by a purge of either calomel or castor oil and a few days' complete rest of the eyes with outdoor exercise. In some of the more persistent instances the pain was permanently suppressed by a few doses of antipyrin. If this condition, however, has lasted a few weeks without attention, it becomes very rebellious, apparently on account of complication with hysteria.

HYSTERICAL ASTHENOPIA.—Although obstinate forms of asthenopia not accounted for by ocular anomalies have been



described since the days of Donders under the names retinal anæsthesia or hyperæsthesia, Kopiopie (Foerster), or nervous asthenopia, they have not been generally considered as a hysterical manifestation.<sup>1</sup> Moreover, most text-books give no exact information regarding their frequency. In my experience hysteria, or if one prefers the term, psychic influence, has been apparent in at least five per cent. of all patients with asthenopic complaints. This figure, however, includes all gradations from the less frequent instances in which hysterical hyperæsthesia of the eyes is the unmistakable diagnosis to those in which an asthenopia due to other influences is either exaggerated by hysteria or perpetuated by it after the other causes have been corrected. The clearest cases are those following traumatism, be it real though slight, or merely imaginary. In others the hysterical complaints are started by a transient conjunctivitis or maintained by a slight chronic conjunctivitis or blepharitis. They may develop in consequence of the acute asthenopia of intestinal origin previously referred to, or they may simply be the result of brooding over the discomfort caused by some error of refraction. I have seen patients—and not so very rarely—whose history taught pointedly that hysterical asthenopia can be suggested by uncalled-for attention by over-zealous oculists.

Hysterical affections are generally described as something more than merely an asthenopic discomfort or headache brought on by use of the eyes. Many of the patients complain of continual pain all day long in and around the eyes. In extreme instances some claim to be unable to use their eyes at all for close work. But this statement is often shown to be untrue or at least much exaggerated by a trial with "new" indifferent glasses, or by the action of the patient while waiting in the ante-room.

Characteristic of hysterical asthenopia is the patient's detailed and emotional description of the suffering, even when this is not stated to be severe. The more the patient's

<sup>1</sup> The best description of hysterical asthenopia is given by French authors; for instance, in Gilles de la Tourette, *Traité de l'hystérie*, 1891, vol. i., chaps. viii. and ix., and Parinaud's "Ocular Manifestations of Hysteria," in Norris and Oliver's *Syst. of Dis. of the Eye* (translated by C. A. Wood), vol. ix., 1900.

narrative shows that his attention has been engrossed by his eyes the more psychic exaggeration can usually be detected. Young children, however, are not so likely to go into details before a strange physician as they may do at home. The diagnosis of hysteria can only be considered when the symptoms cannot be accounted for by any ocular anomaly or systemic condition, like anæmia or pronounced neurasthenia, or when they are out of proportion to any of the causes of asthenopia actually present. In some cases it is impossible to draw a sharp line between the neurasthenic and the psychic factor. Only a minority of these patients present the clinical evidences of hysteria. In many the ocular complaints are the only manifestation. Hysterical discomfort is not often associated with any characteristic ocular stigmata. I have rarely seen with it narrowing of the visual field or the typical reversal of color fields. Demonstrable hyperæsthesia of the skin of the lids to touch and sensitiveness to light are sometimes met with. Constant winking—so-called clonic blepharospasm—is not an uncommon association, especially in nervous children.

It might be questioned whether the name—hysteria—is fully justified in all instances. Many persons otherwise normal can create or perpetuate distressing sensations by concentrating the attention upon some part of the body. Peculiar to hysteria is only the ease with which such fictitious sensations are produced and their subsequent persistence. But between pronounced hysteria and exaggerated emotional impressibility all gradations can be observed. Hence, in some of the instances of asthenopia of this kind it may be more accurate to speak of a psychic exaggeration or psychic origin than to call the patient hysterical.

The only absolute proof of the psychic or hysterical origin of a symptom is the possibility to remove it by influences acting upon the mind. This diagnostic as well as therapeutic test succeeds in many but not all cases of hysterical asthenopia, especially when of recent origin. Positive assurance that no danger threatens the eye, and that recovery will follow, enhances the effect of many an indifferent prescription, or may by itself suffice in the case of an intelligent

patient. I have seen instances repeatedly in which proper glasses had not removed all distress, because the patients still believed that some muscle-error might necessitate an operation, and to whom the assurance that no operation was called for soon gave complete relief. All neurologists, know, however, that hysterical manifestations may in some subjects prove very rebellious, especially after they have lasted long. Such persons we cannot influence through their reason, we must impress the mind with some therapeutic action. Electricity, indifferent collyria, and other suggestive influences may meet with variable success. Of course, all mental therapeutics are bound to fail if there still exists an uncorrected physical reason for the asthenopia. But even when this is absent there remain a number of patients, mainly those distinctly hysterical, who can only get relief by the oblivion resulting from a change of surroundings, or by a mental impression created by means which the conscientious physician hesitates to employ.

## DOUBLE OPTIC NEURITIS COMPLICATING WHOOPING-COUGH.\*

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A DILIGENT search into the literature has revealed reports of three cases of optic neuritis complicating whooping-cough.

I have thought it best to give the full reports of these cases in addition to report of my own case, and have also included an abstract of a case of ischæmia of the retina, coincident with this disease, for reasons given below.

ALEXANDER'S<sup>1</sup> CASE I.—Girl, twelve years old, still under treatment, totally blind, October 3, 1887. Whooping-cough preceded blindness two weeks and accompanied by intense headache. On Sept. 15th, the girl noticed that everything grew darker, and on Oct. 3d was totally blind. Pupils rigid, no reaction either reflective or accommodative. Cornea, iris, nothing abnormal, but ophthalmoscope revealed in the fundus of both eyes optic neuritis.

Under treatment blindness decreased and Nov. 1st was able to count fingers at a distance of eight inches. Middle of Nov. still better and decrease of optic neuritis. Whether there will be complete recovery cannot be said on account of advanced stage of atrophy of optic nerve.

JACOBY'S<sup>2</sup> CASE II.—Girl, six years old, consulted with Dr. Hohlich, Nov. 15, 1888. Patient has had different diseases;

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\* Read before the Western Ophthalmological and Oto-Laryngological Society at Indianapolis, Ind., April 10, 1903.



when two years old pneumonia accompanied by convulsions. From that time child complained of pains in the occiput. The other children in the family have passed recently through all the stages of whooping-cough, and are recovering.

For some weeks the child has suffered from spasmodic cough and occipital pains. The day before yesterday she asked her mother why she remained away so long as it was getting dark. This aroused the mother's attention that the child was getting blind.

Next day she was examined by Dr. Gruening; his findings were dilatation of pupils ad maximum; no reaction to light or convergence; bilateral neuritis without hemorrhages in the opticus; perception of light quantitative. Another examination revealed that the vision was limited to right eye, and that she was able to distinguish larger objects, like a watch, at a distance of five inches.

Child examined again on 18th: Reaction of left pupil, and larger objects could be seen with both eyes. Vision improves gradually. Was normal on November 28th. Ophthalmoscopic examination was negative. Since that time the child has been all right.

CALLAN'S \* P. A. CASE III.—Kate M., aged eleven years, small and weak for her years. When six years old had a very severe attack of whooping-cough, lasting three months. Patient was much reduced by severe whoops and mother feared for her life. At the end of three months of the disease the whoops suddenly ceased, but a very dangerous complication arose—viz., brain trouble. Patient on attempting to walk would become dizzy and stagger, complaining of severe headache and pains in the joints and all over the limbs. Mind wandered at times, was obliged to remain in bed for three weeks, and at the end of that time her headache and dizziness had left her, but she could only see very imperfectly.

The mother, who was not a very intelligent person, noticed that the child in walking would run against tables and chairs, showing plainly that she did not see well.

Patient was examined by a competent oculist, who told the mother that the optic nerves were swollen.

For some months there was improvement in the girl's sight but this failed her again. At the present time there is well-marked white atrophy of both discs. V R, movement of hands before the face. V L, fingers at eight feet.

Here we have a case in which a long-continued attack of whooping-cough had brought about a passive congestion of the brain. This led to choked discs and subsequent atrophy.

Dr. H. KNAPP<sup>4</sup> reports a case of retinal ischæmia in whooping-cough in a boy three years old; total blindness; no hemorrhage in fundus or under the conjunctiva. He believed the ischæmia due to hemorrhagic effusion into the sheaths of the optic nerves, or general anæmia; paracentesis improved vision.

Boy died three months later with pneumonia as had been predicted by Professor Loomis. This abstract of the case is reported because of the theory of pathogenesis advanced.

AUTHOR'S CASE.\*—Oct. 21, 1902, Ida B., aged eight years, came in my service at the Illinois Charitable Eye and Ear Infirmary on account of subconjunctival ecchymosis of the right eye. Her mother gave me the following history: Four weeks before the patient contracted whooping-cough; has been whooping last two weeks. The coughing seizures, she says, are very severe; has six to eight during the night and fewer during the day. The mother says she is well excepting when she coughs. Has a good appetite, plays out-of-doors as usual, sleeps well excepting when the seizures occur. She has never had any illness save an attack of measles two years ago, which left no sequelæ. She has never had convulsions; does not complain of headaches excepting immediately after coughing spells for a short time.

The patient is the youngest of thirteen children, eight of whom are living and well, the others died of "lung fever" and other diseases of childhood at different ages.

The mother is a well-preserved healthy woman. Father's health is good. The patient is a well-developed, rosy-cheeked girl, with no discoverable evidence of illness except during attacks of coughing.

No motor disturbances to be found; possibly deep reflexes slightly exaggerated. Sense of hearing and smell normal.

Examination of the eyes: R, V  $\frac{2}{18}$ ; L, V  $\frac{2}{18}$ . Inspection of the right eye, aside from the subconjunctival ecchymosis, showed dilatation of the pupil, which reacts to accommodation and light; to direct light very feebly. My colleague, Dr. J. Brown Loring, on making the ophthalmoscopic examination of the fundus, called my attention to the slight blurring of both discs.

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\* This case (by invitation) was reported at the December meeting of the Chicago Pediatric Society.

*Oct. 25th.*—Patient presented herself, having ridden on the street car and walked together a distance of four miles.

V, R and L,  $\frac{2}{1}\frac{0}{5}$ . Right pupil still dilated and feebly responding to light. Optic discs more blurred. Slight amount of exudate in the retina below the disc, obscuring the temporal branch of the inferior branch of the central artery of the retina at one point.

Analysis of the urine, both chemic and microscopic, negative.

Temperature 99.2°. Pulse 80. Seems well.

*Oct. 30th.*—Ecchymosis gradually disappearing. V, R and L,  $\frac{2}{1}\frac{0}{5}$ .

Right pupil responds to light better to-day. Neuritis more pronounced. Patient does not now have or ever has had double vision. Temperature 99.2°. Pulse 80.

*Nov. 6th.*—No change in condition of patient, excepting that neuritis is more pronounced and temperature higher, 100° F.

*Dec. 2d.*—V, R and L,  $\frac{2}{1}\frac{0}{5}$ . Ecchymosis gone. Pupils respond normally to light and accommodation. Examination of urine, both microscopically and chemically, negative. Neuritis more pronounced. Mother says the child plays and acts in every way perfectly well. Whooping-cough subsiding. Temperature same as at last visit, 100° F.

*Jan. 15, 1903.*—Seems well, but has increased temperature. 99.5° F. Pulse 80. Coughs occasionally. V, R and L,  $\frac{2}{1}\frac{0}{5}$ .

Fields for red and green, normal. Had difficulty in getting the peripheral fields on account of inability of patient to appreciate the test; both, however, seem normal. Discs still swollen, retinal pigment somewhat disturbed. A blood count, by Dr. E. V. L. Brown, Assistant Pathologist of the Illinois Charitable Eye and Ear Infirmary, and Dr. E. K. Spiece, was made with the following findings:

“Reds,” 4,966,800

“Whites,” 10,000

Therefore, Whites to Reds as 1 to 497.

The blood examination as well as the general appearance of the patient shows that anæmia is not the cause of the neuritis.

*March 31st.*—Temperature normal. Pulse 76. V, R and L,  $\frac{2}{1}\frac{0}{5}$ .

Patient attending school, good appetite, apparently well, however has an occasional coughing seizure. Right disc slightly



swollen but evidently well on in regressive stage. The left disc slightly pale but no swelling present.

*May 20th.*—Swelling of discs entirely gone; a perceptible amount of connective tissue at site of exudate over vessel described above; also a decided deposition of connective tissue in discs. Vision each eye =  $\frac{2}{80}$  +.

Prognosis in this case cannot be definitely known at the present time but it is altogether probable that good vision will remain.

*Analysis of the above Cases.*—A study of these four cases shows that optic neuritis occurs in girls, beginning about the fourteenth day of the convulsive stage in half the cases, opportunity for observing these cases being good; while in the other two cases the complication followed “after some weeks” and “after four months,” respectively, the evidence being not so reliable.

Evidence of cerebral trouble—“intense headache” and “severe headache, dizzy, would stagger,” “mind wandered”—present only in half the cases. Ophthalmoscopic findings of the three authentically reported cases show optic neuritis without hemorrhage in the opticus.

In only one case (author's) exudate in the retina was reported.

In Dr. Callan's case ophthalmoscopic findings were not given excepting the expression “swollen optic nerves.”

Disturbance in motility of the iris is reported in all the cases; in three vision was greatly reduced, while in the fourth there was no disturbance perceptible. Perfect restoration of sight followed in one case (Jacoby's), while normal vision is present in author's case and but little disturbance of sight is probable. In Alexander's case vision improving but no final report made; while in Callan's case white atrophy followed with quantitative vision.

Optic neuritis with and without cerebral complications, as above stated, suggests the probability of the cause not being the same in all cases. In sudden hemiplegia, aphasic disturbances, hemianopsia, etc., coming on during the coughing attacks, modern authors almost unanimously give the credit to *mechanical influences*—that is, rhexis, with the



accompanying hemorrhage into the brain and cerebral meninges, and other circulatory disturbances.

The tetanic expiratory movement which characterizes the coughing attack in this disease increases the intravenous pressure to such an extent that rupture of the smaller veins and capillaries occasionally occurs, producing the above results; in the same way that subcutaneous and submucous ecchymoses are seen in the skin and the mucous membranes.

The optic nerves may become involved in such complications, when meningitis ensues in the form of a descending neuritis.

In the above four cases reported, three of optic neuritis and one of ischæmia of the retina, an attempt at giving the pathogenesis is made by Knapp and Callan only. Knapp explains the case of ischæmia of the retina as being probably due to "hemorrhagic effusion into the sheaths of the optic nerves"; while Callan believes "that long-continued attacks of whooping-cough brought about a passive congestion of the brain with œdema; this led to choked disc and subsequently to atrophy." In this connection it might be well to mention a case reported by Sebrigondi<sup>6</sup> in which a girl of six years is said to have become blind with every coughing spell, produced, he thought, by blood stasis. A. Steffan<sup>6</sup> reports a girl, eight years of age, who saw indistinctly during coughing spells and lost some of the sharpness of sight in the intervals while the spasmodic stage lasted.

*Infectious Influences.*—The consensus of opinion has not settled upon any particular germ as the cause of this disease.

Pronounced leucocytosis,<sup>7</sup> more precisely speaking lymphocytosis, seems to be the only blood change so far observed.

Pathologic changes in the blood-vessels have not been reported, I believe.

However, the well-known predilection that infectious diseases and toxic states have for the vessels, especially of the nervous system,<sup>8</sup> renders it possible that fatty changes occur in this disorder, in the capillary endothelium of the vessels of the brain tract we call the optic nerve.

This infectious disease is characterized by convulsive or spasmodic manifestations. Whether the infective agent excites the respiratory spasm through central or peripheral irritation, or inflammation, of the nerves supplying the pharynx, is as yet undetermined.

Peripheral neuritis does occur in this disease. Eschner<sup>9</sup> has collected the reports of seven cases. Three of these, the cases of P. J. Moebius,<sup>10</sup> E. Mackey,<sup>11</sup> and M. L. Guinon,<sup>12</sup> unquestionably should be so classified. F. A. Craig<sup>13</sup> reports a case which Eschner believes to be inflammation of the 6th and 7th nerves.

The optic neuritis in the case I have reported is probably intraocular, for the especial reason that there has been no disturbance of central vision, no scotoma for red or green, and for the additional reason that peripheral vision is good.

I think it is due to the direct action of the toxins of whooping-cough upon the nerve tissue. The oncoming of the inflammation during the most acute period of the disease, the second week of the convulsive stage, and the gradual recession of both the neuritis and the spasmodic cough, might favor either the mechanical or the infection theory. If the cause is mechanical, the disturbance is exerted *through* the veins and not *outside* of them, as in hemorrhagic extravasation or œdema of the optic-nerve sheaths, for the reason that there has been absence of symptoms of brain lesion.

The blood stasis is but a temporary symptom, the equilibrium of the circulation being soon re-established. It would not account for this condition unless a chronic local venous engorgement of the nerve-head resulted therefrom, accompanied by diapedesis of the leucocytes, etc. Such a condition can, I think, be better explained as resulting from the influence of toxins according to Metschnikoff's theory of phagocytosis.

Generalizations derived from the study of four cases can be, at most, only suggestive.

Conclusions suggested:

1. Optic neuritis complicating whooping-cough seems to occur most frequently in girls (four cases all girls).

2. It occurs with or without evidence of cerebral complications.

3. Vision may or may not be disturbed.

4. Prognosis as to sight good when no cerebral complications exist.

5. That optic neuritis may result from direct action of toxins of pertussis upon the nerve-head.

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## PERISCOPIC LENSES.

By A. S. PERCIVAL, M.B., B.C., CAMBRIDGE.

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IN 1901 I published in these ARCHIVES a paper on periscopic lenses. The table there given of the requisite curvatures of the two surfaces of the lenses is not absolutely correct for spectacles of the usual size, as I had erroneously considered the axial thickness of the lens to be constant. I find, however, that when the increased thickness of a strong convex glass is taken into account, an appreciable deviation from the curvatures there given becomes manifest. As several ophthalmic surgeons have expressed their difficulty in getting periscopic lenses made, or in writing a prescription for them, I send this simpler and more correct table for their use. By this one can see that a  $+6D$  periscopic lens is a meniscus of which the anterior surface has a convex curvature corresponding to that of a  $+15D$  lens, while the posterior or ocular surface has a concave curvature corresponding to that of a  $-9D$  lens. Spectacles ordered according to this table will be accurately periscopic for all eccentric vision within a solid angle of  $50^\circ$  between the powers of  $+8D$  and  $-14D$ . For powers beyond this range extreme eccentric vision will not be so good as centric vision—*e. g.*, with the  $+12D$  lens distinct vision will be obtained of any object about  $20^\circ$  on either side of the middle line, or of any object that lies within a solid cone of  $40^\circ$ .

I might also point out that since my paper was written a German firm of opticians have secured the monopoly of manufacturing toric lenses, so that the difficulty of obtaining



periscopic lenses for astigmatic patients in other countries has considerably increased.

The index of refraction of the glass is assumed to be 1.54.

Power	Anterior Surface	Posterior Surface
- 1D	+ 5.5D	- 6.5D
- 2D	+ 5D	- 7D
- 3D	+ 4.5D	- 7.5D
- 4D	+ 4D	- 8D
- 5D	+ 3.5D	- 8.5D
- 6D	+ 3D	- 9D
- 7D	+ 2.5D	- 9.5D
- 8D	+ 2D	- 10D
- 9D	+ 1D	- 10D
- 10D	Plane	- 10D
- 12D	—	- 12D
- 14D	—	- 14D
- 16D	- .5D	- 15.5D
+ 1D	+ 6D	- 5D
+ 2D	+ 8D	- 6D
+ 3D	+ 10D	- 7D
+ 4D	+ 12D	- 8D
+ 5D	+ 13D	- 8D
+ 6D	+ 15D	- 9D
+ 7D	+ 16.5D	- 9.5D
+ 8D	+ 17.75D	- 9.75D
+ 9D	+ 19.5D	- 10.5D
+ 10D	+ 21D	- 11D
+ 12D	+ 23D	- 11D
+ 15D	+ 27D	- 12D

## POLYPUS OF THE LOWER CANALICULUS.

BY DR. S. C. AYRES, CINCINNATI.

POLYPI of the lachrymal passages are very rarely seen and the literature on the subject is quite barren of cases reported. While this is true of the nasal duct, it is also a fact that polypi of the canaliculi are still rarer. Only one has ever come under my observation and its rarity justifies its publication.

Mr. C. was seen in March, 1902, on account of an annoying epiphora of the right eye which he had had for a year or more past. The eye was healthy in all respects and vision good. He was presbyopic and wore glasses for reading. There was no mucus in the tear sac and nothing to indicate a stricture of the nasal duct. The punctum was displaced and not in contact with the ocular conjunctiva. It pouted out some, but not differently from many I had seen. With an Anel's syringe water passed readily through the nasal duct to the nose. The next day I again used the syringe and water passed as before. As the washing out of the duct had given no relief, I decided to slit up the canaliculus. This was done with a Weber's blunt-pointed knife, and as I finished the incision I was surprised to see a small red polypus lying in the inner angle of the eye. It was attached by a long thread-like pedicle, which seemed to pass entirely through the canal and have its attachment near its inner end or possibly just inside the tear sac. The polyp was pear-shaped and about the size of a grape seed. Slight traction on it broke the slender pedicle and it came away. The epiphora was relieved at once.

Mucous polypi of the tear sac were observed by Janin, 1772; Niess, 1822; Grillo, 1834; Desmarres, 1854. The last in *Maladies des yeux*, tome i., 2d edition, reports a case of

polypus of the tear sac as large as two grains of millet, with very marked distension of the papilla. He made an attempt to squeeze it out through the papilla but being friable it broke off, and he then made an incision through the skin and removed it, and then cauterized the tear sac with silver nitrate.

Von Graefe in vol. i. of his *Archives* (1854) reports two cases of polypus of the tear sac. One was in the person of a girl ten years of age and the other in a man of twenty-four. The former was attached to the posterior wall of the sac and the latter to the anterior wall. The polypi were removed through incisions into the sac which was then obliterated by the use of the actual cautery.

DeWecker, in his *Ocular Therapeutics*, London, 1879, translated by Dr. Litton Forbes, refers to a patient fifty years of age "in whom the inferior lachrymal punctum was traversed by a small polypus about the size of a grain of millet, the pedicle of which was, on section, seen to be situated close to the punctum."

Dr. Theobald, in Norris and Oliver's *System of Diseases of the Eye*, says in his article on "Diseases of the Lachrymal Apparatus," "polypi have been met with (but very rarely) in the canaliculi. They produce epiphora and in consequence of this may set up a chronic conjunctivitis."

E. Hertel (*Graefe's Archiv*, vol. xlviii., p. 50), in an article on "The Pathological Anatomy of Diseases of the Lachrymal Passages," reports a case of, as he says, "a genuine mucous polypus of the tear sac such as we often see in the nose, uterus, etc."

Dr. Strzeminski of Vilna, Russia, in vol. xlix., *Graefe's Archiv*, p. 339, reports a case of polypus of the tear sac.

Parisetti, in a communication to the Royal Academy of Medicine of Rome in December, 1897 (*Bull. della Accademia medic. di Roma*, 1898), reported a case of polypus of the upper canaliculus. As to its rarity, he says that among 50,000 cases in foreign clinics and among those in his own practice this was the first time he had had an opportunity to observe this disease. His case occurred in the person of a young woman twenty-three years of age. There was a marked distension of the canaliculus, its skin presenting a tense and

glistening appearance. It was a firm tumor, but fluctuation could be detected. He first aspirated the tumor through the canal and evacuated some serous fluid. He then slit the canaliculus and a small round hard tumor presented itself. It was pedunculated and attached to the upper wall of the canal. Microscopic examination of the tumor showed it to be a true mucous polypus. He further states that this is the first time any one had demonstrated in a positive manner the possibility of the formation in the canaliculus of a tumor, which, because of its histological structure, deserves the name of polypus.

COMMENTS.—In nearly all cases of polypi of the lachrymal passages, the growths originate and develop in the tear sac. Even where the tumor was confined to the canaliculus, the pedicle would most naturally have its origin in the mucous membrane lining the sac. Parisetti's case is an exception, as he states it was attached to the upper wall of the canal. In my own case I cannot say positively whether the pedicle was attached to the wall of the canal or the sac, as it broke when tension was made upon it. I am inclined to think that some of the intractable cases of blennorrhœa of the tear sac are due to soft flat polypoid growths which partly fill the sac. They are so organized that they resist the ordinary treatment. In such cases I think we are quite justified in opening the sac through the skin and inspecting the mucous membrane, and, if such growths are found, in curetting them and applying appropriate caustic treatment. I would not recommend *le fer rouge* or *la pierre infernale*, nor any destructive caustic, until all other measures had failed. Every effort should be made to save the tear sac if possible. An inspection of the mucous membrane of the tear sac is a harmless procedure and can be safely resorted to in cases of obstinate blennorrhœa. The mucous membrane in such cases must closely resemble the condition seen in mixed trachoma. *Expression* has done much for the relief of trachoma, and it is quite possible that curettement of the tear sac might help to relieve many obstinate blennorrhœas.



## THE EXTIRPATION OF THE LACHRYMAL SAC; ITS INDICATIONS AND TECHNIQUE.<sup>1</sup>

By DR. ARNOLD KNAPP.

*Indications*.:—1. Chronic purulent dacryocystitis; if of some standing and antiseptic treatment has not succeeded in curing the suppurating character or if the sac is dilated. In this group of cases the great danger to the eye in possible corneal affections should not be lost sight of.

2. Repeated attacks of acute dacryocystitis with abscess.

3. Whenever the sac is dilated whether the contents can be expressed or not.

4. Lachrymal fistula.

*Methods*.:—The anæsthesia may be local or general, the local being only suitable in the absence of acute inflammatory conditions. The superficial cutaneous incision may be anæsthetized by the ethyl-chloride spray or by the usual infiltration-anæsthesia. Subsequently the parts can be rendered more or less insensitve by the local applications of a cocaine solution, and in suitable cases it will be found of advantage to inject a weak solution of cocaine into the sac before operation. The incision begins just below the internal canthal ligament and passes down and out along the prominent orbital margin for from  $1\frac{1}{2}$  to  $2\frac{1}{2}$  cm. The ligament may be divided or not. If it should be divided, care must be taken to carefully join the divided parts at the termination of the operation, so as to prevent a possible sinking in of the caruncle. The incision is carried through the subcutaneous tissue and the anterior fibres of the apo-

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<sup>1</sup> Read at Section on Ophthalmology, New York Academy of Medicine, Meeting of March, 1903.

neurosis until the sac itself is exposed. This structure is usually recognized by its pale red or bluish-red smooth uniform surface.

Hemorrhage from the lower part of the incision is apt to be annoying, but can generally be thoroughly controlled by a suitable introduction of the retractors and by compression. The sac is then isolated by blunt dissection from its inner wall; proceeding upwards, the cupola is freed and the sac can be more or less lifted out of the fossa. The outer surface is usually more adherent and has to be separated by cutting. This can be easily done by a pair of small blunt scissors, the attachment above and outwards to the two canaliculi being carefully separated.

The sac is cut off as low down in the lachrymal canal as possible and the canal is thoroughly curetted with a small spoon. With the aid of reflected light, after the edges of the wound are properly separated, a careful inspection is then made of the walls and the roof of the lachrymal fossa with a view of detecting any remaining islet of mucous membrane, granulations, inflamed periosteum, or carious bone. These possible complications must all be properly met and radically treated. We must be especially careful to see that the top of the lachrymal fossa is perfectly clean. If the bone on the inner wall (lachrymal bone) should prove to be diseased and superficial curetting be deemed not sufficient, a free opening should be made right through this into the nose. This enables the removal of the diseased bone and also insures proper drainage, the opening entering the nose in the anterior part of the middle meatus just below the head of the middle turbinal.

The operation is concluded by the exact approximation of the wound edges with two or three sutures, and the cavity is obliterated by proper pressure, and this pressure must be kept up in the dressings for the next few days.

The difficulty and success of the operation vary with the amount of inflammation and adhesions present. Operation in the presence of an acute inflammatory condition is of course more apt to be unsatisfactory as far as smooth and rapid healing is concerned. Still I have found that, unless

the abscess had thinned the superficial integument, the attempt can be made to obtain primary union after extirpating the sac under these conditions. It may be necessary to keep the wound packed for one or two days and then to approximate the incision by sutures.

*Results* :—Primary union with obliteration of the cavity can be secured in most cases. The cases which have proved the most obstinate in my hands have been in children where the dacryocystitis was complicated with disease of the superior maxilla. The scar left in the cases which healed by primary union is practically invisible. The lachrymation has in my cases been insignificant ; it has always been less than before operation, due presumably to the removal of the inflammatory condition. The patients have not found it necessary to apply for further treatment to overcome this symptom.

For *Discussion*, see p. 290 of this volume.

## THE MENTAL DERANGEMENT WHICH IS OCCASIONALLY DEVELOPED IN PATIENTS IN EYE-HOSPITALS.<sup>1</sup>

By CHARLES J. KIPP, M.D., NEWARK, N. J.

THE following cases have been under my personal observation :

1. An American woman, fifty years of age, a farmer's wife and a member of a Protestant church. I *extracted a cataract* from her left eye. At that time I bandaged both eyes after the operation, and kept the patient in bed, in a dark room. Two days after the operation, the patient became very restless, could not sleep, complained of the stuffy air in the room, expressed fear that the nurses, who were nuns, were trying to do her injury because she was a Protestant. She said that the odor of incense which came up from the chapel stupefied her. At night she raved and screamed, tore the bandages from her eyes, and would not stay in bed. I tried to calm her and removed the bandage from the sound eye. I gave her morphine in large doses, but without producing sleep. I then allowed her to get out of bed and ordered the nurse not to allow the patient out of her sight; but, notwithstanding this precaution, she escaped from the hospital, insufficiently clad, and walked six miles to her home. As soon as we discovered her absence we instituted a search and traced her to her home. On the following day she was perfectly quiet and apparently in perfect mental health; she did not remember how she had left the hospital, or how she got home. Her family assured me that on the day after her arrival home her mind was perfectly clear and has been so since. Her eye healed without irritation and the sight is good.

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<sup>1</sup> Read before the Section on Ophthalmology, New York Academy of Medicine, May 18, 1903.



2. An Irishman, sixty years of age, a hatter by trade, came from a village near here; he had all his life been a total abstainer from alcoholic drinks. He was *operated on for cataract*. He was alone in a small but well-lighted room; only one eye had been bandaged. He was kept in bed only a few days after the operation. On the twelfth day after the operation he became very restless, could not sleep, and complained that he heard rats and mice running about the room. One day while I was talking to him he told me that he saw snakes and lizards running about the room and begged me to protect him against them. I sent him home at once, and two days later his mind was in a normal condition. He told me afterward that he did not remember that he had seen snakes while in the hospital. His eye made a good recovery.

3. A German, about thirty-five years of age, the father of a large family, was struck in the right eye by a *fragment of iron*. I admitted him to the hospital for the purpose of *removing the lens in which the iron was embedded*. Other more urgent operations caused me to defer the operation for three days, during which time he had a drop of a 1-per-cent. solution of sulphate of atropine instilled in the wounded eye once daily. He was not confined to his bed and neither eye was bandaged. He appeared to be cheerful when I saw him in the afternoon of the third day after admission, but while speaking he was brushing imaginary bugs off from his person and articles about him. During the night following he jumped out of one of the windows of the ward, and fell a distance of about ten feet, breaking his nose and dislocating both ankles, lacerating his face, and bruising his body very badly. He was at once taken to his home where his mental equilibrium was soon restored. He was then taken to a general hospital where he remained for six weeks; from there he came back to us and was put in the same bed which he had occupied before. I removed the iron from the eye and kept him in the hospital for about ten days. During this time he was perfectly quiet, slept well, and had no return of the mental trouble. I learned afterwards that this man was an amiable, quiet family man who drank beer occasionally but never to excess. He did not remember the occurrences of the night of his desertion from our hospital.

4. A German, about forty-five years of age, a driver of a brewery wagon, who drank beer habitually but not to excess, was admitted to the hospital on account of a *severe injury to his left*

eye. He was put to bed and had warm compresses applied and atropine instilled in his eye several times daily. He was in a room with several other men, and the room was well lighted. One of his eyes was covered most of the time; he was gradually getting better when about the twelfth day of his stay he became restless, could not sleep, although morphine was administered, and at last became delirious and very noisy. I sent for his wife to come to the hospital and to stay with him. While she was on the way, and I was standing near his bed and telling him that his wife was coming to him, he asked of me permission to go to the bath room. I allowed him to do so, and as soon as he was out of bed he ran to a window, and before we could stop him he had smashed the glass with his fist, put his head out the window, and screamed at the top of his voice "Murder, Police, Help," etc. With the aid of several men we got him back to bed, and his wife, who had arrived by this time, endeavored to calm him, but it was of no use. I had him taken home in a carriage. Next day his wife reported that he was calm and self-possessed and had no recollection of his doings in the hospital ward. He has remained in good mental health since then.

5. An American woman, sixty years of age, from the country, was admitted to the hospital for *acute glaucoma* of the left eye. The other eye was blind. She was put into a small, airy, cheerful room. I made an iridectomy under ether. For a week after the operation the operated eye was closed by a bandage, and as the other eye was blind she was in total darkness. She became restless and sleepless about the *fifth day after the operation*, and on the sixth and seventh could hardly be kept in bed. A nurse had to be with her all the time to prevent her from leaving her bed and room. At that time there was a report that there were many cases of small-pox in our city, and people living in the surrounding country were afraid to come to the city for fear of contracting the disease. This woman had had the same fear, and in her wild delirium would say that she had heard many cases of small-pox taken from our hospital during the night. As her eye was not in a condition for her to go out, I transferred her to another and larger room, and made one of her daughters stay with her day and night. This quieted the woman a good deal but not entirely. She recovered her mental health completely in a few days after her arrival home. She has been well since.

6. An American mechanic, sixty years of age, was admitted

for *cataract extraction*. He had a large family who lived about a mile from the hospital; he was visited by members of his family every few days. One of his eyes was covered by a shield, but the other was left open. The room in which he was placed was very light and there were several other men in it. He became restless and sleepless and wanted to get out of bed about a week after the operation. He did not complain of pain anywhere and his eye was doing well. He was given morphine, chloral, and other narcotics, but these had no effect on him. On the *tenth day, about four o'clock in the morning, he suddenly attacked the nurse and tried to kill her by striking her with a chair*. After driving her from the ward, he escaped from the hospital in his night clothes, with bare feet, and walked about a mile to his home. Strange to say, he was not seen by a policeman or other person, so far as I knew. His family were of course greatly astonished to see him. He was put to bed and immediately went to sleep. After eight hours' sleep he awakened all right in his mind and was without difficulty induced by his family to return to us. After that he gave us no trouble. He has since been well mentally.

7. A most distressing case was that of a Polander about fifty years of age, a resident of another city, who was brought to this hospital on account of a *severe injury to the cornea of his right eye*, due to a lime burn. This man was in robust health, very muscular and strong. He suffered much pain from his injured eye. He was put to bed and warm applications were made to the left eye, while the right eye was not covered; he was in a light room with several other men. He was able to converse with but one person about the house, who saw him only about once daily, and then only for a minute. He became sleepless and restless soon after admission but was kept in bed for several weeks. Three days after he had been permitted to be up, and to walk about the wards he was told that he could go home next day. I saw him late in the afternoon of this day and noticed nothing in the man's behavior which pointed towards mental derangement. He retired about nine o'clock. Shortly after two o'clock in the morning an orderly who slept in a room adjoining the ward thought he heard a window sash raised, and immediately began an examination of the windows in the ward. He found one open, and on looking about the ward found that the Polander's bed was empty. A search was immediately instituted, but was unsuccessful. About an hour afterwards the patient was brought to the hospital by



people who had found him a block away from the hospital. He was in his night clothes and bare feet; the ground was covered with snow at the time. He was much bruised and cut about the body and his left femur was fractured. Through an interpreter I learned that this man was greatly worried about his family who were in great want,—were in fact without food and had been begging him to come home. He did not remember how he got out of the hospital, nor that he climbed over two high fences to reach the place where he was found. I transferred this man to a general hospital. His mind has been clear since he entered there. I may mention here that the man was under no restraint whatever while in our hospital, and could have walked out of the hospital any time if he had wanted to do so. His fracture healed very slowly, and on the ninety-sixth day after his admission to the general hospital it was found that he was unable to use the limb. Up to this time he had been perfectly quiet and had shown no signs of mental disturbance; but on the following day, early in the morning, he threw himself out of a window in the fourth story of the hospital, and was found dead on the pavement beneath.

8. An old German, about sixty years of age, in good general health and apparently of sound mind, who had, some time before he came to us, lived and slept in a beer-saloon where he did chores. He was admitted for the operation of *extraction of cataract*. He was very dirty. The *operation was followed by little reaction* and no pain. The operated eye was covered by a shield; the other, which was also impaired in vision, was left open. He was in a well-lighted room with other men; he became restless and could not sleep. On the sixth day after the operation and during the following night he could not be kept in bed, and kept the other patients awake by irrational loud talk; he insisted on going to the place where he had slept before he came here. I sent him there with one of our orderlies; he stayed at this place a day and a night and then came back to us, begging us to take him in. He was quite rational and gave us no further trouble during the two weeks that we kept him.

9. An Irishwoman about seventy-five years of age, who had been living with friends, not in a home of her own, entered the hospital for the purpose of having a cataract extracted. She had been totally blind for some months; she was apparently in excellent general health; she was very talkative but quite rational. I *extracted the cataract from one eye*, and for a week after the



operated eye was covered by a shield; the other eye was open. She was in a well-lighted room with other women. The operation was followed by a secondary cataract, and her sight for some weeks after the operation was not much better than it had been before the extraction. I kept her in the hospital with a view of making a secondary operation. About *five weeks after admission she became restless*, could not sleep, and walked about the room at night. This restlessness increased from day to day. She refused to take medicine and even food, fearing that it contained poison. At last she became violent, shouting and screaming at the top of her voice all day and night, and a nurse had to be with her all the time to prevent her from escaping. As I was unable to reach any of the people with whom she had lived before she came to us, I made arrangements to have her taken to the hospital for the insane, and was about to transfer her there when her son turned up and took her to her former abode. She returned to us two weeks later for the secondary operation, which was successful in restoring her vision. I learned that she became quiet as soon as she reached her former abode, and that she had been perfectly quiet and rational since. During her second stay in the hospital she behaved like a sensible woman.

10. An Irishman, seventy-eight years of age, in good general health, but blind in both eyes from cataract, was admitted for operation. He occupied a well-lighted room in which there were other men. The operation was not followed by a marked reaction and he had no pain. He *began to show his symptoms of mental derangement on the eleventh day after the operation*; he sang and shouted day and night. Sulphonal quieted him somewhat, but it required the presence of several people of his household near his bed to prevent his desertion from the hospital. He was sent home about the fifteenth day, and from that time on his mental equilibrium was restored.

All the cases so far related were cases of surgical operation on the eye, or accidental traumatic injuries of the eye. I have also record of two cases of transient mental aberration in which the patient came into the hospital for a disease of the eye.

11. One was an Irishman, forty-six years of age, in good general health; he had an ulcer of the cornea of one eye; the other was healthy and had good vision. He was in a well-lighted room

with other men. The diseased eye was covered with a compress most of the time; the other was left open. He had locally a 1-per-cent. solution of atropine three times daily. He showed symptoms of *mental derangement four days after admission*. He was very noisy and unmanageable. He recovered his mental equilibrium soon after his return home and has manifested no signs of mental disease since.

12. An Irishman, thirty-five years of age, in good general health, but having an infected ulcer of the cornea of one eye, was placed in the same kind of a room, and received the same treatment as the man last mentioned. He also showed evidence of *mental derangement on the third day after admission*. He refused food and drink and would take no medicine. He was somewhat quieted by hypodermic injections of morphine, but had to be sent home as he disturbed everybody in the room. He speedily recovered after reaching home and has been mentally sound since then.

REMARKS.—All of the cases here reported occurred in the wards of eye-hospitals. Some occupied darkened rooms, but the great majority were treated in well-lighted, cheerful rooms; some were in a room by themselves, but the majority had been in rooms with three or four others. Some were confined to bed, others were dressed and were sitting up and walking about the wards. Only one had both eyes bandaged at the time the mental trouble developed. All the others had either only one eye covered by a shield or had both eyes open when the first symptoms of mental trouble showed themselves. Some had good sight in the uncovered eye, the others had more or less impaired vision in it. Some came from our city, but most of them from some distance. Both sexes were represented, but males predominated.

My youngest patient was about thirty years of age, the majority were over fifty. All were in good general health, and were not suffering pain in their eyes when the outbreak occurred. All were mentally sound when admitted, and also of average intelligence. All were poor, some of them paupers. Most of them could talk English, but some of them could not speak any language with which the nurses

were familiar. Most of the cases had been in the hospital more than a week and some only a few days when the mental trouble began. In most of the cases the delirium developed after operation on the eye, but in two no operations had been done and had not even been proposed to the patients. In the great majority of the cases a solution of atropine had been instilled several times daily, but in a few no mydriatic of any kind had been used before the outbreak. *Recovery from the mental trouble resulted very speedily in all cases in which we could return the patients to their former homes immediately after the outbreak.* A considerable improvement was secured by having the members of the household stay with them and by transferring them to other quarters. In the cases in which the patients' injuries resulting from the attempt to escape were so grave as to require their transfer to a general hospital, the shock or perhaps the change of environment produced a cure of the mental disease. With regard to the previous habits of these people, I have no reliable information; some of them were undoubtedly what are called moderate drinkers, none were drunkards, however, and a number of them were total abstainers from alcoholic drinks; of this I have positive knowledge. In every case in which it was ascertained that the patient was accustomed to drink alcoholic beverages, small doses of alcohol were given several times daily during their stay in the hospital.

SICHEL<sup>1</sup> is generally regarded as the first to call attention to these psychoses as occurring after cataract extractions. He observed eight cases, all in old people. He describes it as an afrebrile delirium. The closure of the lids, in consequence of which the patients no longer know where they are or what has been done to them, appears to be the only cause. They are, so to speak, *dépaysés*. Since Sichel's publication similar cases have been frequently observed and described, and most authors<sup>2</sup> have attributed the mental disturbances to the same cause.

<sup>1</sup> "Sur une espèce particulière de délire sénile qui survient quelquefois après l'extraction de la cataracte," *Annales d'oculist.*, Bd., xlix., S. 154, 1863.

<sup>2</sup> See Snellen, *Graefe-Saemisch Handbuch*, second edition, vol. iv., part 2, p. 112.



SCHMIDT-RIMPLER<sup>1</sup> has this to say on the subject: "After operations on the eye and in the dark rooms of eye-hospitals, we see occasionally the development of peculiar psychoses, the chief characteristic of which is, on the whole, mental confusion; formerly these were designated a delirium, a state of inability to find one's bearings, and incoherence, followed often by amnesia. In modern psychiatry this designation is not often employed; its application is at present restricted to the delirium tremens, and this is classed among the acute hallucinatory paranoia. If we regard primary insane conceptions (paranoia simplex) or hallucinations (paranoia hallucinatoria) as the chief symptoms of paranoia, then the majority of the psychoses under consideration belong to this class.

"The course varies somewhat: usually the patient becomes restless towards evening or in the night; asks to be permitted to leave the bed, or rises without permission; tears the bandages from his eyes; frequently screams; thinks that he is in his own home; converses with imaginary persons, sees individuals who threaten to do him violence or to carry him off; he is in fear of a conflagration or that some other dreadful occurrence will take place. This condition may last several days. If we converse with these people after an attack, they frequently answer quite rationally, but suddenly during the conversation they again are seized with a delusion; sometimes they assert that their previous experiences have been real occurrences. Loss or weakness of memory is also occasionally seen. Often the patients have also a motorial restlessness, they are constantly picking at the bedclothes, and when they are out of bed, walk restlessly up and down the room; sometimes they are incessantly wiping imaginary dust from all articles within their reach. Some of the patients are, however, free from hallucinations, but they are plagued by delusions. Fever is not present."

The same author has shown<sup>2</sup> that these psychoses are observed not only after eye operations, but develop without

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<sup>1</sup> *Die Erkrankungen des Auges im Zusammenhang mit anderen Krankheiten*, 1898, p. 291.

<sup>2</sup> *Archiv f. Psychiatrie u. Nervenkrankheiten*, vol. ix., p. 233.



them in cases where the eyes are bandaged and the patients kept in dark rooms. In several of the cases related by me no operation had been performed and none had been even suggested. In one case the patient was waiting for an operation when he became deranged.

Schmidt-Rimpler further says<sup>1</sup>: "They are by no means due to the impression made on the patient by the operation, which is often trivial, but to the exclusion of the light to which they are accustomed. We are permitted to assume that the organs of sense, in a way, regulate the psychical processes which start and end in the brain. They give constant stimulations, independent of the various perceptions which can be estimated. They keep man mentally awake and clear. If they are excluded, a sort of dream life is produced."

All of which is very interesting, but as in almost all of my cases, the light was not excluded by a bandage and patients were not kept in dark rooms, it is evident that the exclusion of light cannot be regarded as the cause of the mental derangement.

According to the same author: "It is probable, however, that a certain mental weakness exists already at the time these psychoses make their appearance. This will account for the occurrence mostly in old people, in alcoholics, and in mentally weak persons. I do not remember ever to have observed this condition in persons in perfect health, especially among members of the educated class, who were still in mental vigor."

HIRSCHBERG<sup>2</sup> thinks that the sensorium of old people is in a labile equilibrium and the deprivation of all sense impressions starts the delirium.

LUNKIEWICZ<sup>3</sup> thinks that the instillation of atropine solution is alone responsible for the mental disturbances, but this seems to me highly improbable, as no other symptoms of atropine poisoning were present in any one of the cases observed by me; moreover, this remedy had not been used at all in some of my own cases, as well as some reported by Posey (see below), and in one recorded by Hirschberg in 1876.

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<sup>1</sup> *Op. cit.*      <sup>2</sup> Rau, *Centralbl. f. Augenheilk.*, 1899, p. 47.

<sup>3</sup> See Rau.

V. FRANKL-HOCHWART,<sup>1</sup> quoted by Schmidt-Rimpler, recognizes four groups of psychoses after eye operations: First, hallucinatory insanity in non-alcoholics; these patients were from thirty to ninety years of age; the disease began mostly within a few days after the operation, seldom later. Second, simply confusion in senile individuals; in these cases there were no hallucinations; in several of these cases the disease progressed to dementia. Third, delirium in alcoholics; it appeared earlier than in the other cases and healed more quickly. Fourth, inanition confusion in very reduced individuals; three of these died. Schmidt-Rimpler commenting on the above expresses surprise at the length of time required for a cure in these cases. He says that he has never observed this, nor such serious consequences; he is inclined to think that in these cases psychic disturbances were already present when the patients entered the eye-hospital.

I have been unable to find a reference to this subject in the writings of ophthalmic surgeons practising in Great Britain. In Bombay, East India, mental aberration after eye operations seems to be practically unknown, according to N. Herbert,<sup>2</sup> who had made 2354 extractions up to November 5, 1902, and who excludes the light from both eyes for several days after the operation.

I can find but little on this subject in American literature. Dr. W. C. Posey, of Philadelphia, in a paper read before the College of Physicians of Philadelphia, Section on Ophthalmology, February 20, 1900,<sup>3</sup> reported 24 cases of delirium, in 19 of which a cataract had been removed, in 3 an iridectomy had been done, and in 2 there were extensive wounds of the eye. All the subjects were over sixty, except the traumatic subjects who were much younger. The delirium developed in the first twenty-four hours after the operation in 2, on the second day in 8, on the third day in 6, and on the fourth day in 2. No atropine was used in 6 instances. Its employment did not seem to have any influence whatsoever upon the mental condition. Both eyes

<sup>1</sup> "Ueber Psychosen nach Augenoperationen," *Jahresbericht f. Psychiatrie*, vol. ii., parts 1 and 2, 1899.

<sup>2</sup> *The Practical Details of Cataract Extraction*, London, 1903.

<sup>3</sup> *Ophthalmic Review*, London, vol. xix., 235.

were bandaged after the operation in every instance, but the dressing was removed from the unoperated eye in 9 cases as soon as the delirium manifested itself, without giving any appreciable relief to the mental condition. It was specifically noted in 9 cases that there was absolutely no tendency towards mental derangement when they entered. Evidence of previous tendency was present in only 2 senile and in the traumatic cases. The delirium was of the same character in all, beginning with a mild restlessness which rapidly developed in an active delirium with hallucinations and ideas of persecution, but passing rapidly under control by the proper administration of narcotics; permanent affections of the brain being marked in not a single instance. The writer believes that the cause of delirium is largely psychical, and he agrees with Parinaud that it is due to the *preoccupation upon the part of the patient prior to and after the operation*. What the other features are, which in addition to the preoccupation determine the delirium, are as yet unknown. The frequency with which the delirium is encountered should, however, be recognized and proper treatment,—namely chloral and bromides—be administered at its first appearance. The removal of the bandage from the unoperated eye and the discontinuance of the atropine are not advised. Constant oversight and judicious tactful nursing are most essential, and rapid amelioration of the mental condition follows the installation of a proper nurse by the bedside.

In the discussion following the reading of this paper, Dr. DESCHWEINITZ mentioned a case in which after operation on one and bandaging both eyes maniacal delirium developed, followed by dementia lasting two months. Two years later the other eye was operated on and the bandage applied only to this eye. No mental disturbances followed.

Dr. ZIMMERMAN had seen numerous cases in Wills Hospital. Unbandaging the sound eye and getting the patient out of bed was the usual treatment. Dr. VEASY reported two cases in which both eyes had been bandaged and the removal of the bandage from the healthy eye restored the patient's mental health. Dr. RANDALL had removed



the bandage from the sound eye, but with absolutely no result, the delirium continuing uninterruptedly for five days.

Dr. HARLAN stated that the delirium had many types and causes and that no one explanation would be satisfactory for all cases, therefore the treatment must be diversified to meet unusual requirements.

I am no alienist, and have seen but little of insanity. The impression which these cases have made upon me is that *these psychoses were the result of a change in the patient's environment and to an increasing longing to get away from the new surroundings*. This view seems to me to be supported by the fact that all signs of mental disturbances passed away as soon as the patients reached their former homes, or were much quieted, if not entirely restored, by the presence of members of the household from which they came.

I may mention here that, although I have treated and operated many cases at their own homes, I have never observed mental derangement in this class of patients.

I call it a *homesickness, nostalgia*, which ends in a form of melancholia with homicidal and suicidal propensities.

In the treatment of these cases I have never resorted to mechanical restraints, but in the future I shall not hesitate to resort to it when circumstances prevent the immediate removal or return of the patients to their homes. The very serious injury which some of my patients sustained in the delirium, and the danger to which the attendants who watched them were often exposed, would doubtless have been prevented if I had resorted to such measures. The use of hypnotics is of course indicated, but often very large and dangerous doses are required to quiet the patients. Many of them, moreover, absolutely refuse to take medicines and food and drink by the mouth, as they fear they contain poison. In such cases only remedies can be employed that can be given hypodermically. But the quickest way to restore mental equilibrium is to return the patient to his home, no matter how humble or how unsanitary it may be. If this is impracticable, transfer him to another house, or, at least, to another room, and give him the company of some members of the household from which he came.



REPORT OF THE MEETINGS OF THE OPHTHALMOLOGICAL SECTION OF THE NEW YORK ACADEMY OF MEDICINE, HELD ON MONDAY EVENINGS, APRIL 20 AND MAY 18, 1903.

By DR. HENRY H. TYSON, SECRETARY.

MEETING OF APRIL 20. DR. A. DUANE, PRESIDENT, IN THE CHAIR.

Dr. LEWIS presented a **case of bilateral hemorrhagic neuroretinitis of obscure origin**. Patient was a man aged thirty-four years, longshoreman, apparently in good health. Denies syphilis—no definite symptoms of it. Last July he first noticed headaches all over his head, followed by impaired vision in the left eye and later in the right. Received no treatment until last January, when he was given specific treatment. Was examined by Dr. Lewis in March. Urine normal. Blood examination normal; headaches vary. No light perception in either eye, pupils dilated, swelling of papilla equal to about 2.5mm, numerous hemorrhages and exudates throughout fundus. Temperature normal. Knee and ankle reflexes diminished. Sleeps well, appetite good. Treatment, mercurial inunctions and increasing doses of K. I. to 90 or 100 gr. t. i. d. Condition remains the same. L. is in doubt as to the etiology, but thinks it due to cerebral trouble.

Dr. POOLEY thought the symptoms indicated cerebral tumor, and until it increased in size enough to produce some paralysis of extrinsic muscles it would be obscure. In double choked disc the cause was one which produced increased intracranial pressure.

Dr. WEBSTER referred to two similar cases. In one case the autopsy showed cerebral meningitis and not tumor; while in the other the autopsy showed a large glioma of the cerebellum. He

thought that brain tumor should be given as the cause of the symptoms in Dr. Lewis's case.

Dr. LESZYNSKY remarked that the symptoms vary in these cases. You may have small cerebral changes with great disturbance in ocular symptoms, or extensive cerebral changes and slight ocular disturbance. Considers case to be an intracranial growth.

Dr. THOMSON presented a **case of lenticular opacity due to injury clearing up.**

Dr. POOLEY had never seen a traumatic opacity the size of this one clear up as much apparently as this has done. He would be guarded in his prognosis, as he had seen many clear up immediately after injury, whereas vision failed later and eyes became phthisical.

Dr. CHAMBERS thought that the eye would get blind later by detachment of the retina.

Dr. OATMAN showed a **case in which Tenon's capsule was filled with a paraffin ball after enucleation.** He said the enucleation was performed in the usual manner with the following modifications. A long guide suture was passed through each of the four recti muscles before they were cut, so that they could be easily found when required. The hemorrhage was easily controlled by packing the cavity with gauze. After inserting the paraffin ball, the two vertical muscles were united by a single loop suture. The suture included both muscle and conjunctiva. The guide suture was now removed. The two lateral muscles were united in the same manner, and the entire wound closed by sutures. It will be noticed that no sutures were buried. The retraction was rather less than he is accustomed to observe after enucleation. A much larger ball could have been used with advantage, but this was the only size at hand. The stump has good motility.

Dr. LAMBERT thought that the motility of the stump was about the same as that resulting from ordinary enucleation.

Dr. LEWIS stated that Snellen's eyes gave him good results, as regards getting better motility than the ordinary glass eyes.

Dr. MITTENDORF said that Snellen's eyes were very thick at inner corner, and that they do not set well in the conjunctiva in that position, and that some of his patients objected to wearing them on that account.

Dr. DUANE presented a **case of extirpation of the lachrymal sac, done in the stage of phlegmonous inflammation.**

History of epiphora for ten years. The phlegmon had been twice opened, once by another surgeon, once by himself; but as it showed a constant tendency to reform, and as its treatment promised to be tedious he concluded to extirpate the sac. This was done eleven days after the outbreak of the phlegmon. The collapsed sac was distended with iodoform gauze, passed in through the original incision. This facilitated the subsequent dissection. The canaliculi were not obliterated, nor was the lachrymal gland taken out, but the nasal duct was thoroughly curetted. Internal canthal ligament not divided. Primary union with almost invisible scar. Epiphora only on exposure to wind, and then but slight. One slight attack of conjunctivitis since operation, which was done in July, 1902.

Dr. POOLEY remarked that he had practically ceased probing in chronic cases. He favors extirpation of the sac, especially in these cases before cataract extraction.

Dr. THOMSON referred to two cases, one chronic and one acute, on which he operated after the Holmes method with good result.

Dr. TYSON stated that he operated according to the Knapp method; in addition he closes the punctum of upper and lower lids with a galvano-cautery point, and had obtained much better results than without the latter procedure.

Dr. POOLEY presented a **specimen of leuco-sarcoma of the choroid**, and gave a history of the case.

Dr. THOMSON said that the onset of the glaucomatous symptoms did not depend so much upon the size as upon the location of the tumor, especially if it was near enough to the venal vortices to press upon them.

Dr. LAMBERT referred to a case in which the symptoms resembled those in the case under consideration, and in which a small choroidal tumor was found located behind the equator of the eye with detachment of the retina.

Dr. SEABROOK **read a paper on amber-yellow glasses for the examination and treatment of eyes.** He referred to the present activity in the study of photo-therapy in general and the apathy of ophthalmologists in this particular. He then called attention to the action of amber-yellow glass as a ray filter for white light, allowing the light rays to pass through freely, the heat rays partially, and eliminating the actinic rays, the last being the element of white light which causes chemical inflammation and irritation of eyes. He also mentioned that yellow is used as



a standard for determining the index of refraction, and that yellow glass corrects the chromatic aberration of eyes, and dulls dazzling reflections by cutting off the blue violet rays. Amber-yellow glasses No. 2 are nearly equivalent in spectroscopic analysis to glass stained by a saturated alcoholic solution of tropalolin 000, which is a perfect filter for the actinic rays. The glasses are graded like blue or "smoked" glasses, No. 1 being the lightest; No. 2 had been mostly used by him up to the present time. A lens of  $2\frac{1}{2}$ -inch focus had been used for oblique and indirect examination, made by splitting a white lens and introducing a plain amber-yellow glass. This lens, a "Loring" ophthalmoscope with an adjustable amber-yellow glass to go over the mirror, and No. 2 spectacles were exhibited to the section. In examinations with the yellow glasses it had been found that the iris contracted less than with the usual light, and that the light was more agreeable to the eyes than white light, congestion, lachrymation, and photophobia being less in inflamed eyes when it was used. Healthy eyes being tested with No. 2 glasses, vision was found to be neither improved nor diminished in less than 5%. The color was always pleasant to the retinae. The blue and violet spectral rays are eliminated from the atmosphere and sometimes from objects colored with pigments, while others, as light blue, followed more the laws of the mixture of pigments.

The glasses are indicated in cases of neuralgia about the eyes and retinal hyperæsthesia evidently due to light irritations, but care should be taken regarding steady use in chronic cases of neurasthenia. In cases of keratitis, vision seems to be improved in acute central cases, not in chronic peripheral ones; symptoms of irritation are benefited. The effect upon irregular lenticular astigmatism in cataract is similar to that in irregular corneal astigmatism. Cases of chorio-retinal disease showed improvement of vision with amber-yellow glasses. Three cases of glaucoma were reported, in two of which, one having nyctalopia from nicotinism, the chronic irritation from light had been entirely relieved by yellow glasses where "smoked" glasses were a failure. Probable benefit to be derived from amber-yellow glass as a protection for eyes from the electric light, and the wards of eye hospitals were then mentioned, and the possible benefit to patients with the most frequent forms of summer catarrh — conjunctivitis with papillæ, follicles, or phlyctenules, and photophobia and lachrymation.



In conclusion it was stated as a summary that amber-yellow glass protects eyes from irritation and improves vision.

Dr. LAMBERT stated that he had no experience with amber-yellow glasses, excepting those used as landscape glasses of that color.

Dr. POOLEY referred to an albinotic case, a man of seventy years of age, who made the observation himself that the amber-colored glasses gave him more relief than any others he had ever tried.

Dr. DUANE has prescribed amber or yellow shades for persons working in electric-light factories; and he mentioned the fact that two Russian observers some time ago advised using amber glasses after extraction, and they noticed that the visual acuity was improved in some cases for long-range seeing—*e. g.*, shooting, etc.

MEETING OF MAY 18, 1903. DR. A. DUANE, CHAIRMAN.

Dr. H. W. WOOTTON presented some **cases showing the definitive results produced by advancement without tenotomy in strabismus**, and gave histories of respective cases. The results, as observed in patients presented, were uniformly good.

Dr. E. GRUENING presented a **case of removal of angioma of the brow without removal of the skin**. Patient was a child, three years old, who had a large cavernous angioma excised from the brow, lid, and orbit. It had been operated upon a number of times previously with the actual cautery. Dr. Gruening made his incision along the brow, using a T-shaped clamp to prevent hemorrhage. After excising the angioma and freeing the skin of the blood-vessels, he replaced the skin and sutured it in place. The blood-vessels have not reappeared.

Dr. H. KNAPP said the principle of removing vascular tumors with knife or scissors was not new, and he had extirpated such tumors from his earliest surgical attempts. These tumors have a capsule, and the palpebral ones lend themselves most easily to extirpation because they can be clamped. He remembered two such cases very well on account of the apparent difficulty to remove them, and the surprisingly good results they yielded owing to a modification of the operative method. The first was a baby of about six months. It had a cavernoma of the inner half of the upper lid, a small one at the inner portion of the lower lid, and a third one at the nasal side of the orbit. These tumors communi-

cated with one another by small vessels. Prof. O. Weber (the distinguished professor of surgery at Heidelberg, well known by his treatise on *Surgical Pathology*, which appeared about 1865), whom he consulted, said it might be necessary to remove the whole tumor mass, and eventually take out the eye. The parents would not consent to this plan, nor did it particularly appeal to him. He first removed the tumor of the upper lid, after having clamped it; then he everted the lid, exposing the orbital portion of the tumor, introduced a horn-plate along the eyeball and pressed it behind the tumor fast on the inner wall of the orbit to compress the afferent vessels, and then extirpated the mass with forceps and scissors; there was no particular bleeding. He left untouched the smaller and flatter tumor on the lower lid. This tumor gradually shrunk without leaving a trace. The second case was a facsimile of the first. Dr. Gordon Buck, of this city, had it in charge, and told the mother the growth should be destroyed with the galvano-cautery. He met him in consultation and told him of the case he has just spoken of. Dr. Buck approved of the plan and Dr. Knapp was asked to do the operation. It was done successfully. A year or two ago, a woman of about thirty years, with a splendid physique and a particularly fine countenance, came to his office, and said her mother, who had been a former patient of his, had requested her, when she came to New York, to call on him and thank him for having saved her from a great disfigurement. He has repeatedly put in practice the principle of destroying the afferent vessels in vascular tumors, teleangiectasias particularly, after which the tumors gradually disappeared.

Dr. POOLEY thought that Dr. Gruening's method of operating was different from Dr. Knapp's, in that he reflected a thin flap of skin, then shaved off and extirpated the mass, and replaced the skin flap. He said he remembered the second case of Dr. Knapp, having assisted him during the operation.

Dr. LINN EMERSON read a **report of a case of extensive laceration of the sclera**, with presentation of specimen. Patient was a child, two years of age, who fell upon a broken teacup, inflicting a large, ragged, triangular wound in the temporal region, extending deep into the orbit. Lids and outer canthus were intact, anterior chamber filled with blood; T — 3. Attempt to suture the globe before enucleation failed, as posterior part of wound could not be reached. Collapsed globe was enucleated. Specimen shows rupture extends almost from cornea to optic nerve.

Dr. H. H. TYSON presented a **case of traumatic bilateral ophthalmoplegia** (complete on one side), **with recovery in one eye and slight improvement in the other.** The patient, a Greek, occupation, maker of tin boxes, while at work on or about March 22, 1903, had his head caught and compressed in the machinery, and was struck just below the infraorbital margin of his right eye, with an iron tooth, a part of the machine. He experienced the symptoms of basal fracture, such as loss of consciousness, extensive hemorrhage from nose, mouth, and eye, paralysis of the ocular muscles, loss of vision, and severe headaches. Both eyes were immediately closed, being swollen, the right one the more prominent. He was unable to move them. Eight or nine days later he was able to open his right eye, but vision was poor but gradually improved. He noticed almost immediate loss of sight in left eye after the injury. On April 24th he was examined at the clinic of the New York Ophthalmic and Aural Institute: right eye, vision  $\frac{1}{30}$ , slight optic neuritis, motility slightly restricted outward; left eye, complete ophthalmoplegia, with atrophy of optic nerve. Vision nil, pupil dilated, no reaction to light, accommodation, or consensually. Eye absolutely fixed and not a particle of motility remaining. No history of syphilis or evidence of constitutional disease. Diagnosed as fracture of the base of skull, involving the optic foramen and sphenoidal fissure in left orbit with a fracture of the floor and inner wall of right orbit, the loss of function in right eye being due principally to hemorrhage, while in the left eye the cause was hemorrhage and fracture, especially the latter. Treatment consisted of potassium iodide, under which great improvement was noticed. St. pr., right eye: vision  $\frac{1}{30}$  +, motility normal, fundus normal. Left eye: faint light perception, pupils responded to accommodation-convergence and consensually. Ptosis less by half, and slight motility inward and upward. No apparent change in fundus from previous examination. The interesting facts were the completeness of the paralysis in his left eye at the beginning, with quite encouraging improvement in the left eye as regards motility and appearance, and the complete recovery in his right eye.

Dr. JULIUS WOLFF presented a **case of optic-nerve atrophy**, with following history. S. H., æt. forty-three years, always had good health. No specific or alcoholic history. Right eye has diverged as long as he can remember, and was almost totally



blind. Vision in left eye poor, and has not changed any for years. Examination by neurologist negative. Right eye, vision p. l. faint; left eye, vision with + 3 cyl. ax 15 T =  $\frac{1}{6}$ %. Field of vision constricted by only 5°-10° for white. Fundus right eye, marked atrophy of disc, apparently not post-neuritic. Vessels normal; left eye, atrophy of disc present but less marked than in the right. Medullated nerve fibres above disc also atrophied. Skull has peculiar shape—peak or tower skull. Atrophy of optic nerve has been found repeatedly in connection with such cranial deformity, and is due either to too narrow optic foramen, or to meningitis accompanying premature ossification of basilar sutures of skull, resulting in tower skull.

Dr. C. KOLLER presented a **case of partial xerosis of the conjunctiva of upper lid.**

On account of the absence of Dr. CALLAN, Dr. SKEEL presented a **case of removal of a piece of steel from the iris without an iridectomy.** The operation consisted of making an incision in the cornea with a keratome; the iris with foreign body prolapsed through it. The piece of steel was then removed with the Hirschberg magnet, the iris was replaced, and the wound healed nicely. The iris was adherent to the lens for about six days, but was now free and lens was uninjured. Vision,  $\frac{2}{3}$ o.

Dr. SARIL showed **trachoma forceps** with serrated ridges on fixed plate instead of rollers.

Dr. C. J. KIPP read a paper—"The mental derangement which is occasionally developed in patients in eye-hospitals" (published in extenso in these ARCHIVES, p. 376).

Dr. H. KNAPP said Dr. Kipp's collection of cases was a valuable contribution to this rather singular mental derangement, which seems to be met with more in ophthalmic than in other surgical hospitals. Dr. Kipp's cases refuted all nosological hypotheses that have thus far been advanced. His views seem plausible, well supported by his cases, yet the material was not sufficient to be adopted unreservedly. Dr. Knapp reported a few cases, to illustrate three categories. I. The **light variety**.—A lady of about fifty-five, vigorous, restless, self-willed, impulsive, brave, accustomed to all the comforts of a luxurious residence, entered the hospital reluctantly. She stood the simple extraction without flinching and made a good recovery. On the third day, she rebelled; she got out of her bed, dressed somewhat, and declared she would not stay any longer, saying her stay had no object any



longer — the eye had never given her any trouble—she could see as well as ever, and she did not see why she was kept there. Dr. K. was in the hospital and went to see her at once. He found her sitting on her bed, determined to leave. He sat down before her, and told her that it was not yet time for her to leave. He knew the cause of her excitement ; she was losing her mental balance, a kind of temporary insanity, which was not very rare in patients operated for cataract. She protested and insisted on going. He told her, as her physician, he could not let her go, she jeopardized the good results of her operation. She had promised to stay the two weeks necessary for the recovery from a cataract operation. He could assure her from manifold experience that this singular insanity was transient, in a day or two her mind would be as well balanced as it had been before. She listened with astonishment and calmed down. He told her to let the nurse undress her and put her to bed again ; he would go out of the room and come back in a quarter of an hour. She yielded, went to bed, and when he returned she was quiet and said — “Doctor, you are right, I was foolish. I thank you for your kind words. I shall not act that way any more ; I shall stay, and as soon as you can operate on my other eye, I shall give it you, and shall stay as long as you desire.” The attack was over, she had no relapse and left on the fourteenth day with an ideal success. Another mild case was that of a man seventy-nine years of age, very wealthy, a good business-man. Extraction without accident ; the first two days quiet ; in the third night, at twelve o’clock, he was called by a messenger to come at once to the hospital, Mr. E. was out of his mind and wanted to go home. When he arrived he found him dressed in calling attire, his silk hat on, pacing his room, with both eyes unbandaged. He greeted him cordially and thanked him for the excellent cure of his eye ; he could see with it, and he had had no pain or ache. He was perfectly well, and he was sure the Doctor would not object to his changing the hospital quarters for his house, which was not far away. He (Dr. Knapp) told him : “You are a business man, a good, prosperous, and judicious man.” He said he was proud of having that reputation. He (the Doctor) said : “This is not an hour for you to go home, let us sit down and talk business. You have considerable real estate, some in the vicinity of the College of Physicians and Surgeons. The trustees have their eyes on it.” “They can have it, if they pay for it,” he answered. They talked half an hour, then he told him that he

was sleepy and wanted to go to bed, and it was time for him to retire also. He had become quiet, the attack was over, and he had no recurrence.

II. The **violent variety**.—Of that he related the recovery of one of his Heidelberg patients. It was the Mayor of the city of Worms. On the third day after the extraction, he became deranged and showed the picture of the most violent maniacal attack. It took four strong male nurses to prevent him from doing mischief to himself and others. He was rabid, particularly to him; would have him put in prison for keeping a free and peaceful man, a citizen of no mean town, incarcerated like a criminal, etc. He quieted down the second day and was all right the third.

III. A **third group** comprises the **chronically unbalanced**, with a **suicidal tendency**. Of these he had had two: one, an old man, instrument-maker, who, on the fourth or fifth day after a successful extraction, told him, during the change of the dressing, that he was very sick. The Doctor would not see him any more to-morrow. He spoke comfortingly to him, and when he was out of his room he told the head nurse: "That man must have a nurse at his bed the whole night." The Doctor continued his round and when he had scarcely entered a room on the next floor, the patient had thrown himself over the banister of the winding staircase down to the first floor and was instantly dead. A second case was that of a lady of about fifty years, who had the craze that her relatives wanted to shut her up in an insane asylum. She had undergone a successful extraction with a smooth recovery. When prior to her departure two of her relatives were in the parlor, together with her private nurse, who had constantly watched her, and then left the parlor for a few minutes, the patient went out quietly, ran up the four flights of stairs unsuspectingly, threw herself over the banister and fell dead on the first floor.

When the first patient had committed suicide, Dr. Knapp had a brass-railing of 1.5 foot in height put on the banister at every floor landing of the staircase, so that nobody could throw himself over. The last patient, with cunning energy, had swung herself over the banister near the brass addition. It is well known that suicides occur in every hospital in spite of the most careful watching.

These two were the only ones that occurred in the New York Ophthalmic and Aural Institute among 15,091 inmates treated during the thirty-two years of its existence.

To recapitulate : Mental derangement in hospitals occurs in three categories :

(a) **Light cases**, slight mental disturbance ; in **eccentric** and **odd** characters. These cases can be quieted by plain or kind talk—best by the operator,—so that the attack does not develop further.

(b) **Violent mania**.—For those he knows no treatment except anodynes and watching by strong attendants.

(c) Persons of **mild melancholic disposition with temporary aggravations and suicidal tendencies**. This group requires the greatest attention during their whole stay in the hospital. Dr. Knapp is inclined to think that in all those cases there exists a previous mental unbalance, though it may be difficult to recognize. It is well known that the state of incubation of insanity may last a lifetime. Whether this hypothesis is founded or not, the existence of this singular psychosis after operations inculcates the rule to include the mental condition of our patients into the pre-operative examination. Dr. Kipp, in his cases, has examples which are at variance with all conditions that have been suggested as the causes of this post-operative mental disturbance. He thinks that they may be due to homesickness (nostalgia). It would be desirable to enquire whether these disturbances have ever been observed in patients operated on in their homes.

Dr. E. GRUENING never had any cases of mental derangement after operating. He prefers that his patients occupy their room in the hospital for two days before operation.

Dr. POOLEY had seen several cases and thought that the trouble was due to nostalgia.

Dr. TYSON referred to four mild cases which he had seen, three of which had been operated upon at the hospital, and one at the patient's home. All the cases made good recoveries, both as regards their sight and mental equilibrium. While he thought that nostalgia might be a contributing cause, he did not think it the main one ; but was disposed to consider a previous dormant tendency to mental derangement as existing in these cases. He said it had been customary for years at the New York Ophthalmic and Aural Institute to have the patients occupy their rooms at least a day previous to operation.

Dr. LESZYNSKY agreed with Dr. Kipp's conclusions as to the change in environment being the predisposing cause in most cases.



REPORT OF THE MEETING OF THE OPHTHAL-  
MOLOGICAL SOCIETY OF THE  
UNITED KINGDOM.

By C. DEVEREUX MARSHALL, F.R.C.S.

FRIDAY, MAY 8, 1903. W. LANG, F.R.C.S., PRESIDENT,  
IN THE CHAIR.

2  
Drs. A. PAINE and F. J. POYNTON read a paper on **rheumatic iritis**, in which they endeavored to establish the identity of the pathological changes in rheumatic iritis with those occurring in other accepted rheumatic affections. The diplococcus of rheumatism developing in the tissues and cells rather than in the fluid exudate rendered the identification of micro-organisms in fluids obtained by paracentesis of the anterior chamber unsatisfactory, while the opportunities of examining the iris in the acute phase of the inflammation in the human subject did not often occur. The specimens therefore of iritis exhibited which showed the diplococcus in situ had been produced in the rabbit. The distribution of the organisms was similar to that occurring in synovial membranes showing dense clumps.

Observations were made by the President, Messrs. HARTRIDGE and HOLMES SPICER in regard to the extreme rarity of iritis as a complication of true acute rheumatism, and to the probability that most of the so-called cases of rheumatic iritis had really their origin in gonorrhœa.

Dr. POYNTON in reply said that the special micro-organism when present was easy to find, but he was not sanguine about finding them in portions of iris removed in the quiescent period, as the subsidence of active inflammation was dependent on their destruction or reduction to a state of latency.



Mr. W. H. H. JESSOP described **two cases of tuberculous choroiditis associated with conjunctival tubercle**. The first was that of a girl aged nine, who had a round smooth mass on the conjunctiva which reached nearly to the limbus of the cornea. This was incised and tubercle bacilli were obtained from it. The retina was detached with two masses obscuring the disc. The eye recovered with vision of  $\frac{6}{18}$ .

The second case was a woman aged twenty-three who had tubercular disease of the breast and a strong family history of tubercle. While under observation, masses in the choroid were seen to spread from the centre towards the periphery, leaving but little trace behind them, and now, upwards of three years after, the patient has recovered with good vision.

Mr. SYDNEY STEPHENSON said that tubercle of the choroid, like some other conditions regarded as rare, ceased to be so when systematically looked for. Among 119 cases of tuberculosis he had examined in surgical wards, he had found about 10% in which the choroid was affected. He endorsed Mr. Jessop's observations as to the absence of residual pigment and vitreous opacities.

Mr. JULER mentioned one case that had recovered under local treatment alone. Remarks were also made by Messrs. JOHNSON TAYLOR and HOLMES SPICER.

Mr. A. F. MACCALLAN reported **five cases of glaucoma in which adrenalin caused increase of tension**. The increase of tension occurred in all the cases consequent on the use of adrenalin in eyes which had already had marked symptoms of glaucoma. Except in these cases, this was not the invariable consequence of the use of adrenalin, but the writer had seen two cases in which retinal hemorrhage had occurred after its use. Other cases in which it had been used showed no change in tension or in the fundus, but the vascular constriction produced by adrenalin appeared to prevent the absorption of other drugs such as myotics.

Mr. JESSOP spoke of the pain and increased tension produced by adrenalin in scleritis and episcleritis. He found that engorgement followed constriction of the vessels.

Mr. J. H. PARSONS thought that the effect of adrenalin was by no means uniform. Complications following its use were probably due to dilatation of collateral or deep-seated vessels and reactionary dilatation of the superficial ones after the initial contraction had subsided.

Remarks were also made by Messrs. HARMAN, HOLMES SPICER, and JOHNSON TAYLOR.

Dr. E. DONALDSON communicated **a case of proptosis and deformity of the head** in a male child aged two and a half years, the youngest of three. The eye had several times become dislocated forwards. There was no defect in other special sense or in intelligence. There was slight horizontal nystagmus, but the lids covered the eyes during sleep. There was no pulsation, but the globes could not be pressed back. So far as could be made out with the finger, there was no deformity of the orbital plate. The vision was defective, the optic discs being pale, but the corneæ were clear. The case was similar to one shown to the Society in 1894, the shallowness of the orbits being due to premature synostosis, as pointed out by Swanzy.

# SYSTEMATIC REPORT ON THE PROGRESS OF OPHTHALMOLOGY IN THE SECOND AND THIRD QUARTERS OF THE YEAR 1902.

BY DR. G. ABELSDORFF, IN BERLIN; PROF. ST. BERN-  
HEIMER, IN INNSBRUCK; DR. O. BRECHT, PROF. R.  
GREEFF, PROF. C. HORSTMANN, AND DR.  
R. SCHWEIGGER, IN BERLIN ;

WITH THE ASSISTANCE OF

Dr. A. ALLING, New Haven ; Prof. E. BERGER, Paris ; Dr. DALÉN, Stock-  
holm ; Dr. J. HERRNHEISER, Prague ; Prof. HIRSCHMANN, Charcow ;  
Dr. J. JITTA, Amsterdam ; Dr. KRAHNSTÖVER, Rome ; Mr.  
C. DEVEREUX MARSHALL, London ; Dr. P. VON  
MITTELSTÄDT, Metz ; Prof. DA GAMA  
PINTO, Lisbon ; Dr. HEINRICH  
SCHULZ ; and others.

Translated by Dr. WARD A. HOLDEN.

(Continued from page 309.)

## X.—ORBIT AND ACCESSORY SINUSES.

302. **Le Blanc.** A case of secondary osteomyelitis of the orbital walls. *Inaug. Dissert.*, Berlin, 1902.

303. **Loeser.** A contribution to the subject of metastatic abscess of the orbit (bacterium coli). *Zeitschr. f. Augenheilk.*, viii., 1, p. 24.

304. **Purtscher.** A case of metastatic ophthalmia. *Centralbl. f. prakt. Augenheilk.*, xxvi., p. 257.

305. **Goldzieher.** On syphilis of the orbit. *Sammlung zwanglosen Abhandlungen aus dem Gebiete der Augenheilk.*, iv., Marhold, Halle, 1902.

306. **Reynier.** Traumatic arterio-venous aneurysm of the right cavernous sinus. Inefficacy of ligation of the common carotid. Treatment with gelatine serum, resulting in recovery. *Bull. d. l. soc. de chirurg. de Paris*, Mar. 19, 1902.

307. **Fromaget.** Fibro-chondroma of the orbit. Extirpation through the upper cul-de-sac, with preservation of the ball and the vision. *Arch. d'opht.*, xxii., 6, p. 380.

308. **Israel.** Operation for orbital sarcoma with preservation of the eyeball. *Centralbl. f. prakt. Augenheilk.*, xxvi., 4, p. 108.

309. **Hirsch.** Two cases of exophthalmus: 1. Sarcoma of the orbit. 2. Retrobulbar hemorrhage. *Arch. f. Augenheilk.*, xlv., 4, p. 283.

310. **Causé.** Cases of intermittent exophthalmus and varicose dilatation of the veins about the eye. *Inaug. Dissert.*, Giessen, 1902.

311. **Reuchlin.** A case of bilateral pulsating exophthalmus. *Inaug. Dissert.*, Tübingen, 1902.

312. **Coppez.** A case of disease of the ethmoid sinus. *Soc. belge d'opht.*, Apr. 26, 1902.

313. **Oliver and Wood.** Orbital abscess associated with antral and ethmoid disease. *Amer. Journ. Med. Sciences*, July, 1902.

314. **Friedenwald.** Cavernous angioma of the orbit. *Amer. Journ. of Opth.*, Apr., 1902.

315. **Thompson, E. S.** An unusual case of subperiosteal hemorrhage of the orbit following an uncomplicated delivery. *Pediatrics*, Mar. 15, 1902.

The case described by LE BLANC (302) began with a superficial and mild cauterization of the lid with acid. From this an erysipelas developed with deep abscesses of the cheek and orbit, which, following a recurrence of the erysipelas, attacked the bone, so that the pars orbitalis, the greater portion of the body of the zygoma, and the inferior wall of the orbit were found to be sequestered and were removed. A fistulous tract remained open for over a year. The optic nerve was atrophied, which the writer attributes rather to a thrombophlebitis than to the slight optic neuritis. In order to explain the affection of the bone the writer assumes that there was osteomyelitis, a periostitis following an orbital abscess not being sufficient to cause so much destruction.

LOESER (303) describes an abscess of the orbit, an affection that is rare in comparison with phlegmon. The patient, a woman, had suffered long with gout and gall-stones. An attack of gall-stone colic with chills and fever was supposed to be the source from which the metastasis in the orbit arose. Some days later an iridocyclitis came on with great pain, and in a week the pupil was blocked, there was chemosis of the conjunctiva, and slight protrusion and limitation of mobility, without much redness or swelling of the lids. Two weeks later a small corneal infiltration appeared, leading to a ring abscess and perforation of the cornea without the escape of any pus. Pus had in the meantime exuded from the orbit and in it the bacterium coli was found. The actual



nature of the affection thus manifested itself late. Loeser believes that an embolus of the ophthalmic artery extended to the bulbar and orbital branches, and that the inflammation in the ball was a chronic one and that in the orbit an acute suppurative inflammation.

The clinical interest in PURTSCHER'S (304) case lies in the observation of the first stage, and in the combination of purulent ophthalmia and orbital abscess, and further in the fact of masses of pneumococci being found in the pus of the vitreous.

In his systematic treatise on syphilis of the orbit, GOLDZIEHER (305) calls syphilitic periostitis the point of origin from which most of the different syphilitic affections of the orbit proceed. It is much rarer than changes in the surrounding bone, which, however, are constantly found in orbital disease and are of great importance from the point of differential diagnosis. Osteoscopic or pressure pains are also a clear evidence of syphilis. From the periostitis, which begins mostly at the orbital margin, the disease develops along the fascia of the orbit. From the foci at the margin of the orbit and also from those in the orbit, fistulas arise which leave scars less indrawn than those caused by tuberculous disease of the bone. It is noteworthy that together with the periostitis and gummata in the orbit other organs become involved. Therapeutically only the most energetic mercurial and iodide treatment is of any avail, and often this is unsuccessful.

REYNIER (306) reports a case of arterio-venous aneurysm of the right cavernous sinus in which the ligation of the common carotid on that side produced no improvement; the injection of gelatine-serum, proposed by Lancereaux and Paulesco for aortic aneurysm, brought about a complete disappearance of the exophthalmus and tinnitus, although a diminution of vision remained.

BERGER.

FROMAGET (307), after splitting the outer commissure, removed through the conjunctiva a fibro-chondroma as large as a chestnut, which had developed in the course of eight months in a girl of eighteen, between the muscle funnel and the roof of the orbit, and had pushed the eyeball forward and downward and outward. Immediately after removal of the tumor the ball took its natural position again, and the result was satisfactory save for a moderate ptosis and some diplopia.

V. MITTELSTÄDT.

In a case of exophthalmus of 25mm that had developed in the

course of five years and had been preceded seven years before by unilateral pain in the head and ear, ISRAEL (308) removed the growth, which was thought to be a sarcoma, by Krönlein's method. He began the incision in the skin at the level of the supraorbital margin and carried it down between the external canthus and the orbital margin. From the upper end of the incision he carried another horizontally along the upper margin of the orbit to its middle. The lid was then dissected up without disturbing the levator, and turned toward the nose. The tumor was readily removed, although it had perforated the roof of the orbit. It filled the entire orbit. Microscopically it proved to be a fibro-sarcoma. Some ptosis remained. There had been no diplopia before the operation.

The writer believes that his method, without the interference with the bone according to Krönlein's method, gives one better access to the orbit than Knapp's method. It would be better to cut through the levator and suture it later than to stretch it unduly. Orbital sarcomas are often encapsulated and have no tendency to return; the diffuse tumors of the orbit are malignant.

In HIRSCH'S (309) first case the lachrymal sac was removed in January on account of suppuration, and the soft bone of the infra-orbital margin was curetted until an opening was made into the antrum of Highmore. In November the softened portions of the superior maxilla near the orbit were removed, as were also tumor masses from the ethmoid and sphenoidal sinus. A year later another operation was undertaken, after which the patient died. For a year the floor of the orbit was wanting yet the eye remained useful. The masses removed at the second operation proved to be chondro-sarcoma. The writer believes that the lachrymal-sac trouble gave rise to the sarcoma.

The orbital hemorrhage (Case 2) Hirsch believed to be due to a rupture of a branch of the ophthalmic artery in consequence of venous stasis in excessive exertion. There was perfect recovery without special therapy because the patient had refused an operation for suspected orbital tumor.

After a consideration of the literature, CAUSÉ (310) offers two new observations of intermittent exophthalmus — that is, cases in which when the body is bent forward or the jugulars compressed an exophthalmus appears. With this displacement, due to varices in the orbit, the orbital fat atrophies and the fasciæ become loosened, so that finally the eye occupies its normal position only

when the body is erect or thrown backward. In a case that came under treatment early, a pressure bandage and care of the body brought about complete recovery and in another case partial recovery.

REUCHLIN'S (311) patient was thrown against a post, striking the back of his head. He became unconscious, vomited, and then noticed noises all over his head. On the third day, chemosis appeared in the lower half of the right conjunctiva, with ptosis, exophthalmus, and muscular paralyses on each side. Six weeks later, chemosis came on in the left eye, vision diminished, and on each side were ptosis and pulsating exophthalmus; even the chemosis pulsated. Over the entire skull were heard sounds synchronous with the pulse. A diagnosis of injury of the carotid in the cavernous sinus was made. Compression of the right carotid lessened the pulsation on the right side. The effect of this compression was increased by long rest in bed and the retinal veins became thinner. The sight in the right eye, however, was lost entirely. Compression of the left carotid only diminished the vision in the left eye. The chemosis continued. Finally ligation of the right common carotid was considered.

From a study of the literature, continuing the tables of Sattler and of Keller, it appears that after ligation there is recovery in 68% of cases, no result in 21%, and death in 9%; in digital compression cases, in 22%; electrolysis is equally uncertain, and the ligation of the ophthalmic vein is better.

COPPEZ (312) observed a remarkable case of inflammation of the ethmoid cells, which had developed in a boy of thirteen after a coryza. In another clinic where the patient had been treated previously a diagnosis of empyema of the antrum of Highmore was made, but puncture did not lessen the symptoms—exophthalmus and diminution of vision,—nor did any pus escape. Transillumination revealed a lack of translucency in the frontal sinus and antrum on the affected side. Since the rhinoscopic examination and the deviation of the eye outward indicated an affection of the ethmoid, all the sinuses were opened, when it was found that the frontal sinus and the antrum were normal, while there was pus in the ethmoid cells. After the removal of a large necrotic portion of the latter, recovery took place in a week. BERGER.

OLIVER and WOOD (313) relate the case of a girl, thirteen years old, who after suffering from toothache developed pain in the left



eye, swelling of the lids, proptosis, and divergent strabismus,  $V = \frac{8}{30}$ . There was a thick discharge from the left nostril. Later a hard mass could be felt in the inferior nasal portion of the orbit. The antrum, when opened through the canine fossa, contained some soft tissue and a little pus. It became necessary to open an orbital abscess, which was found to involve the ethmoid cells. The patient recovered from the ocular symptoms. Interest centres in the question whether the original cause of the disease was in the antrum or the ethmoidal cells. It is not improbable that it was in the former, which would make the case exceedingly rare.

ALLING.

FRIEDENWALD (314) reports the removal in toto of a cavernous angioma of the orbit through an incision in the upper lid. Vision of the eye was preserved.

ALLING.

In THOMPSON'S (315) case, one day after birth the eye began to protrude. A mass could be made out well back in the upper part of the orbit. After enucleation, several drams of blood in clots and serum came out. No fracture could be felt, although this was the most probable cause.

ALLING.

#### XI.—CONJUNCTIVA.

316. **Falta.** On spring catarrh. *Arch. f. Augenheilk.*, xlv., 4, p. 296.

317. **Simi.** Ophthalmia due to a bug. *Bull. d'oculist.*, xxi., 4.

318. **Steffens.** The ocular conditions in erythema exsudativum multiforme Hebræ. *Klin. Monatsbl. f. Augenheilk.*, xl., 11, p. 50.

319. **Praun.** Aborted blennorrhœic conjunctivitis. *Centralbl. f. prakt. Augenheilk.*, xxvii., p. 270.

320. **Straub.** The displacement of the mucosa of the retrotarsal fold upon the tarsus in trachoma. *Centralbl. f. Augenheilk.*, xxvi., p. 137.

321. **Junius.** The pathological anatomy of granular conjunctivitis according to recent investigations. *Zeitschr. f. Augenheilk.*, 1902, viii., *Ergänzungsheft*.

322. **v. Arlt, F. K.** The treatment of trachoma with the citrates of copper and silver. *Wiener med. Wochenschr.*, 1902, No. 35.

323. **Kalt.** Infectious tumor of the conjunctiva, sclera, and ciliary body. *Bull. de la soc. d'ophth. de Paris*, March 7, 1902.

324. **Rumschewitsch.** Two cases of hypertrophy of the semilunar fold. *Klin. Monatsbl.*, xli., p. 109.

325. **Blum, David.** On tumors of the conjunctiva with special reference to neoplasms of the caruncle. *Inaug. Dissert.*, Giessen, 1902.

326. **Stoewer.** On proliferation of the conjunctival epithelium with cystic degeneration and its relation to nævus. *Graefe's Archiv*, liv., 3, p. 436.

327. **De Berardinis.** Melanosarcoma of the semilunar fold. *Ann. di Ottalm.*, xxxi., 3, 4, 5.



328. **Rumschewitsch.** A case of adenoma of the glands of Krause. *Klin. Monatsbl. f. Augenheilk.*, xl., 2, p. 105.
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330. **Valude.** Conjunctival lymphoma. *Bull. de la soc. d'opht de Paris*, June 3, 1902.
331. **Cirincione.** On the structure and genesis of conjunctival cysts. Naples, Ed. Pasquale.
332. **Ackermann.** On a case of multiple cyst formation in both lower retrotarsal folds. *Arch. f. Augenheilk.*, xlv., 1, p. 71.
333. **v. Forster, S.** A case of pathological formation of pigment in the conjunctiva. *Festschrift zur Feier des 50 jährigen Bestehens d. aerztl. Vereins Nürnberg*, 1902.
334. **Oblath.** Congenital filiform anchyloblepharon. *Arch. di Ottalm.*, ix., 9-10.
335. **Stephenson, Sydney.** Tuberculosis of conjunctiva. *Brit. Med. Journ.*, May 3, 1902.
336. **Smith, R. W. Innes.** Gonorrhoeal synovitis in an infant suffering from ophthalmia neonatorum. *Ibid.*, June 7, 1902.
337. **Bardley, J.** Tuberculosis of the conjunctiva. One case. *Ophth. Record*, July, 1902.
338. **Morrow, E. P.** A puzzling case of infection of the conjunctiva. *Ibid.*
339. **Alleman.** Amyloid degeneration of the conjunctiva. *Annals of Ophth.*, July, 1902.
340. **Bell, J. M.** A subconjunctival dermoid cyst. *Ibid.*
341. **Veasey.** Adenoma of the lachrymal caruncle, with the report of an additional case. *Ibid.*

FALTA (316) distinguishes six forms of spring catarrh which he describes as follows :

*First form.*—No changes are to be seen in the eye. There is photophobia and in strong light slight ciliary injection. This form soon passes over into the second form. It is only the beginning of the catarrh, which probably always begins so, but usually passes soon to the more developed form, although occasionally it may persist for months and be confounded with the lymphatic ocular affections.

*Second form.*—This is the typical and most frequent form of the catarrh, with the well-known hypertrophy of the tarsus of the upper lid, which, as Goldzieher says, looks like chagreen. The entire region has an opalescent appearance. The conjunctiva of the lower lid and of the retrotarsal folds are either merely hyperæmic or in a state of simple catarrh. This form is frequently confounded with trachoma.

*Third form.*—Reddish-brown nodules appear about the cornea,

sometimes encroaching upon it. Loops from the conjunctival vessels run to these nodules. The eye is irritated, there is slight photophobia, and the iris is often hyperæmic with ciliary congestion. Rarely the palpebral conjunctiva is somewhat catarrhal, giving off a little secretion. This form is mostly readily confounded with phlyctenulæ and also with fascicular keratitis.

*Fourth form.*—At various points on the bulbar conjunctiva are one or two flat, fleshy-red, gelatinous infiltrations to which many vessels run. This form may be confounded with episcleritis.

*Fifth form.*—The simultaneous occurrence of the second and third forms.

*Sixth form.*—The simultaneous occurrence of the second and fourth forms.

HERRNHEISER.

SIMI (317) found the cause of a severe conjunctivitis with ulceration of the cornea to be a cimex lectularius which had acted as a foreign body.

STEFFENS (318) reports on conjunctivitis in the prodromal or eruption stage of erythema multiforme which previously has only been seen by ophthalmologists abroad. It appears in the palpebral aperture in both eyes with circumscribed injection and infiltration upon which vesicles or nodules develop. The subjective annoyance is trifling, and since the eye-changes disappear with the improvement in the general condition no local treatment is required.

An eye was red in the evening but without secretion. In the morning there were excessive secretion and chemosis. PRAUN (319) found gonococci, touched the conjunctiva with 2 % silver, and instilled 10 % protargol. The following morning there was no secretion and no gonococci could be found.

STRAUB (320) finds that after trachoma the conjunctiva is movable over the tarsus and has the appearance of the conjunctiva of the retrotarsal fold. He finds also a white scar along the margin of the tarsus and recognizes in this the shrunken conjunctiva which has by traction displaced the retrotarsal fold. This shrinking is relatively not dangerous for the eye and never leads to entropium, but it shows that the retrotarsal folds should not be excised.

Citrate of copper, which ARLT (322) has rescued from the oblivion of ocular therapeutics and used in the form of a 5 to 10 % salve, contains much copper and is of slight solubility, like

citrate of silver. Therefore it irritates but little, the patient can soon return to work, and the salve may be used by the patient himself as often as three times a day. The trachoma is cured quickly without leaving scars. The remedy is not adapted for cases of lymphatic conjunctivitis, excessive secretion, large corneal ulcers, or ciliary injection. Small ulcers were found to heal readily. Preparations of iodine must not be given at the same time. When citrate of copper is not well borne, Arlt begins with itrol. The excess of this powder is to be removed from the conjunctival sac, while the citrate-of-copper salve should be well rubbed in and allowed to remain.

KALT (323) demonstrated a laborer, aged fifty, with a ring-shaped ulcer about the cornea  $1\text{cm}$  broad, involving the conjunctiva, episcleral tissue, sclera, and ciliary body. The corneal margin exhibited changes resembling pannus. A piece of tissue excised for diagnostic purposes was found to be composed of granulation tissue with many giant cells. No bacteriological examination was made. Morax believed that the case was one of tuberculosis, and recommended for diagnostic purposes an injection of tuberculin and inoculation of guinea-pigs with bits of the tissue. BERGER.

RUMSCHEWITSCH'S (324) cases, as the microscopic examination showed, were simple cases of hypertrophy of the plica semilunaris. Each patient was about thirty years old. In one the light rose-colored tumor measured  $1\text{cm}$  in height and  $0.6\text{cm}$  in breadth, while the free margin was about  $2\text{mm}$  broad. The caruncle was normal, without connection with the plica, which was also sharply limited from the conjunctiva. The plica was so large, however, that the tears ran over and the lids could be closed only in their temporal portions. It was excised without loss of blood.

In the second patient the growth in each eye extended to the cornea and the middle of the retrotarsal folds, and a sound could be passed beneath it. It was  $0.5$  to  $3\text{mm}$  thick, and caused lachrymation and deformity.

BLUM (325) has collected the published cases of tumor of the caruncle and the plica semilunaris, and classifies them according to their pathological character, and discusses their therapy and prognosis. He reports a new case of hypertrophy of the caruncle with the development of hairs; concretions were found in the sebaceous glands. Papillomata, on account of their tendency to recurrence, are to be excised deeply; the hemorrhage is then



severe. Fibromata often bleed when touched with the finger or even spontaneously. Adenomata of the caruncle are heteroplastic structures, since glands are not present normally. The writer presents one case of adenoma in a woman of fifty-seven. Angiomata, which are mostly congenital, act mechanically like the other tumors and cause lachrymation and the like. Injections are regarded as dangerous; one should excise down to healthy tissue, use the cautery, or snare off the growth. Dermoids and lipomata appear also, but remain benign. Epithelioma, carcinoma, and sarcoma, usually pigmented, also occur. In conclusion, he reports a case of subconjunctival cysticercus in the outer portion of the sclera (they generally are found at the inner angle), and a tuberculosis of the conjunctiva and the lachrymal sac which caused growths apparently polypoid, and recurred four times.

STOEWER (326) saw, in connection with a fresh traumatic conjunctivitis and an old pterygium, a 2.5mm thick, partly gelatinous, partly yellowish-red tumor in the inner-upper quadrant of the bulbar conjunctiva, which contained a spherical transparent cyst 2mm thick and some smaller ones. He excised the tumor, which had existed from childhood and caused no inconvenience. On microscopic examination, it was found to be an unpigmented nævus into which cones of conjunctival epithelium had grown and then undergone cystic degeneration.

The case of melanotic sarcoma of the plica semilunaris observed by DE BERARDINIS (327), arose from a pre-existing nævus. Recovery followed operation.

KRAHNSTÖVER.

In a patient aged sixteen, who had worn an artificial eye for seven years, leaving it off only in the last six months, RUMSCHEWITSCH (328) found an egg-shaped growth in the outer half of the orbit, of pale rose color and hard consistence, 3cm long and 1cm thick, about which a sound could be passed on all sides, except for an attachment 1cm broad to the lateral half of the upper retrotarsal fold and an attachment 1mm broad to the middle of the lower retrotarsal fold. After microscopic examination, the writer regards the upper attachment of the benign tumor as the point of development from the glands of Krause. The lower attachment was doubtless due to injury by the artificial eye and subsequent adhesion.

MEYERHOF'S (329) patient was a boy of eight, with a tumor of the lids that had grown so large four months after an injury that



it appeared 2cm thick under the upper lid, blue and translucent, soft as a lipoma, and movable under the skin but not over the tarsus. In the lower lid it was as large as an almond. In its subconjunctival portion it appeared as a yellow, translucent vesicle flattened against the ball, and in the lower cul-de-sac it had the appearance of a cock's comb. When pricked, clear yellow liquid escaped. A diagnosis of multiple lymphangioma was made and an operation undertaken. In fact, there was a pure cavernous lymphangioma of the region of the sac, palpebral and bulbar conjunctiva, and tissue beneath the orbicularis muscle, at some points almost submucous. The writer discusses in detail the literature, the various sorts of lymph tumors, their diagnosis and their prognosis. When in the conjunctiva they are often stationary, but as cavernous tumors in the orbit they may endanger the eyeball. Therapeutically it is often sufficient to prick them, use the galvano-cautery, or excise a portion of the tumor, after which the remainder shrinks or remains stationary.

VALUDE (330) presented a case of bilateral lymphoma of the upper retrotarsal folds, in which there was at the same time a swelling of all the lymph glands of the head and neck, as well as a lymphomatous degeneration of the tonsils and the posterior portion of the soft palate. Examination of the blood revealed a great increase in the number of white corpuscles. BERGER.

In CIRINCIONE'S (331) exhaustive monograph on cysts of the conjunctiva, particular weight is laid upon the acquired cysts as compared with the congenital. The writer divides the former into superficial and subconjunctival; and among the latter he records an interesting observation of cysts due to *filaria inermis*.

KRAHNSTÖVER.

ACKERMANN (332), who has examined microscopically the cysts of the retrotarsal fold recently described by Schmidt-Rimpler, believes that they may arise in one of two ways: (1) from a gland of Krause and (2) from the cystic degeneration of indipping of epithelium after a chronic catarrh. The fact that there was never found an epithelial connection between the cysts, even when they were small and the conjunctival covering was visible, led the writer to believe in the Krause-gland theory.

v. FORSTER'S (333) patient, a woman of fifty-two, had noticed, since 1894, small black spots in each eye. The bulbar conjunctiva was flecked with black, and the patches extended to the

fornix and at some points even into the cornea. When some of them were removed with a sharp spoon, the writer obtained membranes in which pigment lay between the cells of the superficial epithelium of the conjunctiva. The microchemical iron reaction was negative, nor could any tumor be found. The writer believed that from some organ of the body blood pigment which had lost its iron had migrated into the conjunctiva, as is seen particularly well in the conjunctiva in the case of melanotic tumors.

OBLATH (334) described a case of anchyloblepharon in an infant eight days old, in which a narrow band united the two lids 5mm from the inner canthus. Broadened at either end it was filiform in its middle portion and contained connective tissue and blood-vessels.

KRAHNSTÖVER.

STEPHENSON (335) describes two cases of tuberculosis of the conjunctiva. The first is that of a child aged seventeen months, who had been losing flesh for four months. A lump was noticed in the lower lid and corresponding to this on the inner side was an ulcer. There was a family history of tuberculosis. The child was thin and pale, with circular ulcers on the buttocks and enlarged lymphatic glands in the neck and groin. There was a notch at the edge of the lower lid and a semicircular ulcer 7 by 5mm on its inner side. Several small pale elevations like miliary tubercles lay in the conjunctiva near the ulcer. Scrapings revealed tubercle bacilli. The child afterwards developed optic neuritis, with a tubercle in the choroid, and then died. An autopsy could not be obtained.

The second case was a child, aged fifteen months, with a tuberculous family history. The lid was red and thickened, and it had been discharging for several weeks. The free edge was eroded and on the inner side was a shallow ulcer 10 by 5mm. Scattered tubercle bacilli were found in the scrapings. The ulcer was excised and the resulting cavity filled with a graft which healed well. Microscopically the ulcer showed several miliary tubercles with typical giant cells, but the sections were too thick to allow of tubercle bacilli being found.

Stephenson thinks that tubercle of the conjunctiva is not so rare as is generally supposed, and he has found it present in about one in fifteen hundred cases.

MARSHALL.

The child seen by SMITH (336) suffered severely from ophthalmia neonatorum. The mother had a vaginal discharge, and the

father suffered from gonorrhœa six months previously. When fifteen days old the child had well-marked synovitis of the right knee, and the case was undoubtedly one of gonorrhœal rheumatism. This disease is rare and tends to get quickly well and does not lead to ankylosis of the affected joint.

MARSHALL.

MORROW'S (338) patient had intense swelling of the conjunctiva and lids, pain in the eye and temples, swelling of the parotid, and temperature 104°. After five days, the temperature subsided and smallpox eruption developed.

ALLING.

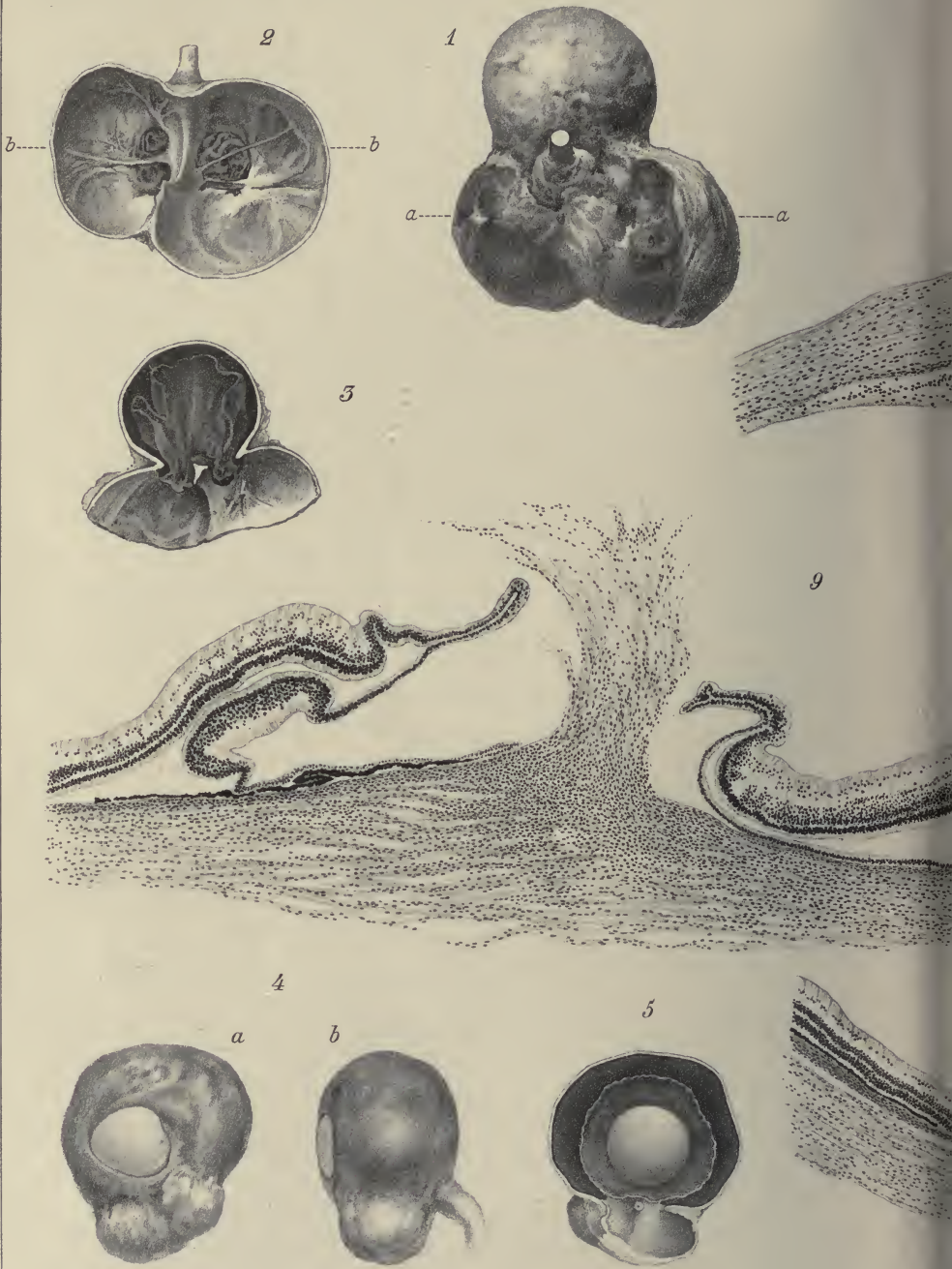
ALLEMAN'S (339) patient, an Italian fifty-four years old, presented enormous thickening of both lids of the left eye with narrowing of the palpebral fissure. A hard mass over which the skin moved freely could be felt in both lids. The conjunctival surfaces looked stretched over a waxy mass of yellowish-red color. The cornea was surrounded by a mass of similar appearance. Microscopic examination revealed typical amyloid degeneration originating in and around the arteries and capillaries and extending to the subjacent tissue. There was also a small amount of round-cell infiltration, with no normal structures. Trachoma was not present.

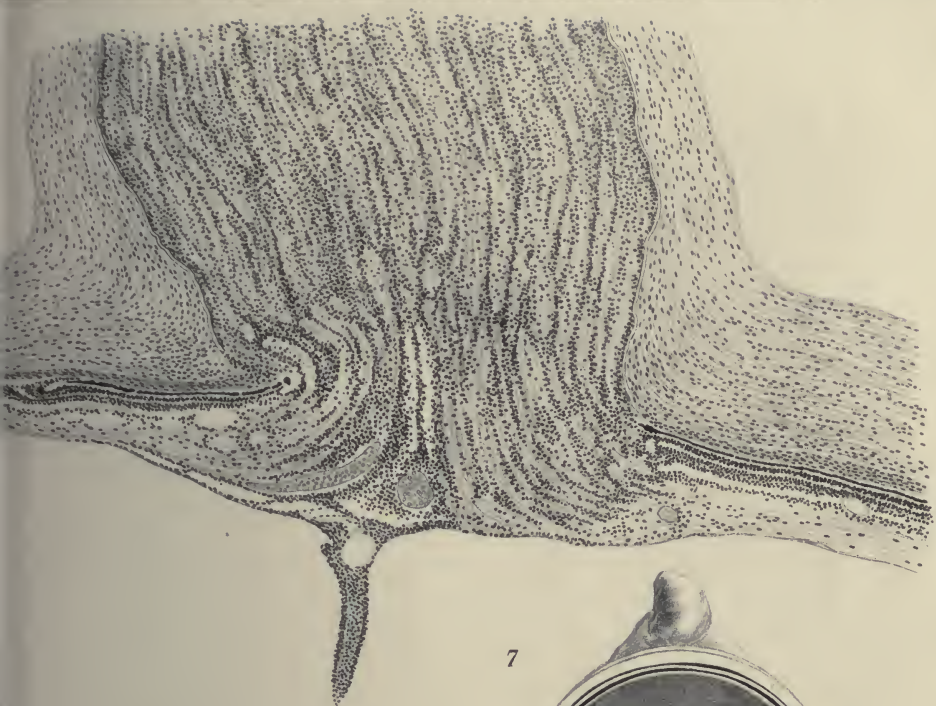
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(*To be continued.*)



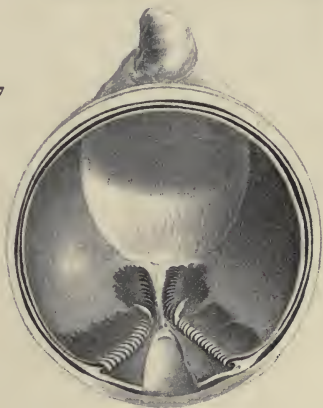




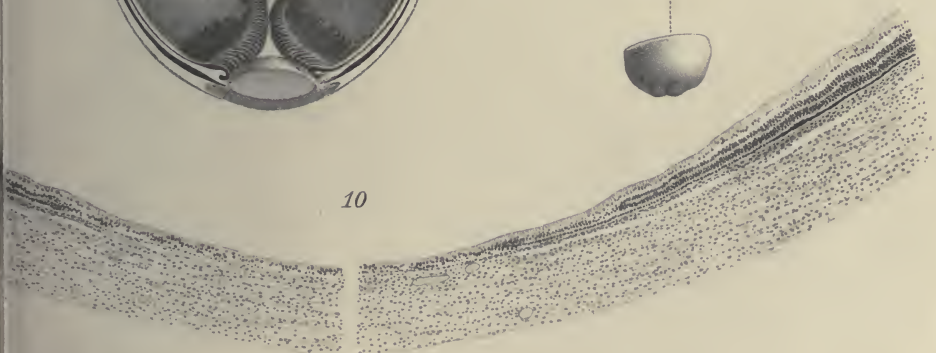


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## ARCHIVES OF OPHTHALMOLOGY.

## CLINICAL CONTRIBUTIONS TO THE KNOWLEDGE OF RARE AFFECTIONS OF THE CONJUNCTIVA AND SKIN OF THE LIDS.

BY PROF. J. v. MICHEL, BERLIN.

[With six colored figures on Plates I.-II. of Vol. XLII., 1-2 (1900), of the German Edition.]

Abridged Translation by Dr. WARD A. HOLDEN.

OF the following material, four cases were seen in the Würzburg University eye clinic and one in the Berlin University eye clinic.

Their great rarity apart, these cases should be of general clinical interest, since they exhibit an unusually typical character, and have scarcely been correspondingly represented pictorially elsewhere.

**CASE I. — Retention cysts of the sweat glands of the skin of the face and lids.**

B. K., a woman of fifty-five. The patient states that for at least twelve years there has been unilateral sweating of the entire left side of the face and neck, particularly after active exercise, in hot weather, and after eating certain acid foods. For about this same period, vesicles have appeared on the lids and face and have become more and more extensive. With the increase in the number of vesicles, their size and consistency have increased, particularly in hot weather. When well filled, the vesicles cause itching, but otherwise no symptoms.

The skin of both lids of both eyes has sprinkled over it numerous contiguous, round, sharply circumscribed elevations from 1-4mm in diameter, filled with a watery liquid. The covering of the elevations is tense, and when pricked a watery drop escapes. The elevations are particularly numerous and large about the inner angle of the upper lid. The same elevations appear on the



skin of the forehead and down the face to the region of the lower jaw on each side. Otherwise the skin is of normal appearance.

On the left side of the face there are pronounced symptoms of paralysis of the oculo-pupillary fibres of the cervical sympathetic, namely, slight ptosis, enophthalmus, and myosis, the pupil scarcely dilating when the illumination is reduced, while the right dilates normally. Finally the tension is slightly reduced as compared with that of the other eye.

The further examination of the eye revealed R: myopia of 11. D, V =  $\frac{1}{4}$ ; L: myopia of 10. D, V =  $\frac{1}{8}$ . In both eyes: beginning cataract, floating opacities of the vitreous, large temporal staphyloma, and incipient central chorio-retinitis.

Without doubt there was in this case an excessive sweating in connection with sympathetic paralysis. Later the vesicles appeared which are to be regarded as retention cysts of the sweat glands. After being pricked they soon refilled; only cutting them off or destroying the cyst wall prevented their recurrence.

The clinical picture here has a certain similarity to that frequently spoken of, particularly by English physicians, as dysidrosis or pompholyx or cheiro-pompholyx. Without symptoms of inflammation, there develop on the palms, soles, or other portions of the body vesicles varying in size from the head of a pin to a pea, which frequently coalesce to form large vesicles. Crops of these may recur for weeks. In some cases the contents are of a purulent character. Careful microscopic examination has shown with certainty that there is in these cases no blocking of the ducts of the sweat glands, but a localized inflammation in the papillary layer of the corium.<sup>1</sup>

CASE 2.—**Herpes facialis of the lower lid.** See Fig. 1, Plates I.—II.

In a woman of thirty, a redness and swelling of the right lower lid came on with her menses. About the middle of the right lower lid the skin was greatly reddened and swollen. In the middle of the inflamed area was a group of small vesicles, some discrete, others confluent, with purulent contents (Fig. 1). Some of

<sup>1</sup> Cf. Peterson, "Beiträge zur Kenntniss der Schweissdrüsen-Erkrankungen," *Arch. f. Dermatol. u. Syphil.*, 1893, p. 443.

these were already drying up and are depressed. The condition had lasted a day and a half when the patient was first seen. According to her statement the contents were at first of a watery character.

The drying became more marked, and yellow or brown crusts formed, depressed in the centre. Gradually the redness and swelling diminished, the crusts fell off, and in a week the skin appeared normal again.

In respect to the diagnosis, I need hardly say that in appearance and course this case corresponded completely to the herpes facialis which frequently appears on other portions of the skin, as, for example, the region of the mouth.

**CASE 3.—Eczema impetiginosum necroticum of the eyelids; later a chancre of the conjunctiva of the lower lid.** See Figs. 2-4, Plates I.-II.

An illegitimate female child of five developed an inflammation of the skin of the eyelids and part of the face two weeks before.

The eyelids are greatly swollen, reddened, and exhibit an ulcerated surface. The entire lower lid is involved, and the ulceration extends beyond the lid both nasally and temporally and then circles round the upper lid (Fig. 2). The floor of the ulcer is partly covered with blood-stained brown and yellow crusts and partly is exposed and bleeds when touched. The ulcer has a sharp line of demarcation, particularly below. The nature and development of this ulcer were shown in the foci on the brows and face, which appeared partly as large and small pustules with dried-up contents, partly as round ulcers covered with crusts or weeping and suppurating. A diagnosis was made, therefore, of eczema impetiginosum of the face and lids, to which were added evidences of superficial necrosis of the right lids.

Agar cultures showed the presence of streptococci.

Conjunctiva and cornea were normal.

The anamnesis did not permit a conclusion as to whether the skin affection was perhaps not primary but one arising from an area previously affected with erysipelas.

Cicatrization advanced, and the floor of the ulcer became clean and covered with skin. The ulcerated surfaces assumed a light bluish-red color and the scars exhibited a whitish stippling (Fig. 3).

After the healing was finished in the course of fifteen days, suddenly an excessive watery secretion from the right eye was noticed, together with a marked injection of the tarsal conjunctiva of the right lower lid, and a small deep ulcer slightly external to the middle of the lid, that looked suspiciously like a chancre (Fig. 3).

This ulcer rapidly extended laterally and in depth, and there suddenly appeared a number of small round yellowish infiltrations in the palpebral conjunctiva, the fornix, and the bulbar conjunctiva (Fig. 3). On the bulbar conjunctiva there appeared also an excoriation corresponding in location to the ulcer of the lid when the eye was closed, and suggesting an inoculation by the ulcer of the lid. The affected area was of a dirty-gray color.

The original ulcer spread until the skin of the entire lid margin was involved (Fig. 4). The lashes fell out, and in the skin about the ulcer there appeared a great number of the same small round yellow infiltrations that had previously existed in the conjunctiva.

The middle of the right lower lid became gradually harder and more cartilaginous to the touch.

Two weeks after the appearance of the ulcer the preauricular and submaxillary glands on the right side began to enlarge. No other glandular enlargements were observed, and there was no eruption.

A diagnosis of chancre of the tarsal conjunctiva was made, and this was confirmed by Professor Seifert, whose report was as follows: "The affection, on account of its hardness and the typical sclerosing lymphadenitis, must be regarded as a primary syphilis. The injection must have occurred while the eczema existed, by the direct inoculation of the conjunctiva near the lid margin where it was denuded of epithelium. How this occurred could not be found out. The mother of the child has no manifest symptoms of syphilis, but there was a pronounced universal sclerosing lymphadenitis, which made a latent syphilis seem probable."

The treatment was begun with mercurial inunctions. After three weeks of this, the swelling of the lower lid diminished, the floor of the ulcer was covered with granulations, the infiltrations of the conjunctiva and skin had become smaller. The superficial ulcer in the temporal portion of the conjunctiva was healed. The cornea throughout remained normal. The local glandular swellings had decreased somewhat, but elsewhere there was extension of the swellings. No changes appear in the mucosa of the mouth and throat.



When last seen the middle part of the lid was still thickened, the lashes gone, the ulcer almost entirely cicatrized, and in its place a slight depression in the lid margin; the small infiltrations of the conjunctiva had become very small and those of the skin had disappeared.

The results of the inunction treatment also supported the diagnosis, and to this early treatment is to be attributed the non-appearance of an eruption.

The small round yellow infiltrations in the skin and conjunctiva are deserving of notice. The infiltrations on the conjunctiva were entirely similar to enlarged or new-formed follicles in the process of purulent degeneration. One must assume that the syphilitic virus was quickly diffused through the entire conjunctiva, and, as in trachoma, the expression of the infection consisted not only in an accumulation of leucocytes in the so-called follicles already existing but also in the formation of new ones. Similar infiltrations or nodules are found in the neighborhood of tuberculous ulcers of the conjunctiva. The nodules in the skin are to be regarded as similar localized infiltrations in the subcutaneous cellular tissue.

**CASE 4.—Syphilides of the skin and scleral conjunctiva.** Fig. 5, Plates I.—II.

W. A., a widow, aged forty-seven, states that she has had an inflammation of the left eye for a short time, and thinks it to be connected with severe pains located chiefly in the left forehead and side of the head.

On looking at the patient and considering her statements, one was at first inclined to regard the affection as a herpes zoster over the distribution of the first branch of the left fifth nerve, and the more so since the appearance and arrangement of the eruption on the left half of the face seemed to correspond to the picture of that affection (Fig. 5), yet a more careful examination revealed the presence of a slight eruption on the right half of the face and on other parts of the body.

In the vertical meridian of the left eye bordering the upper margin of the cornea was a round ulcer of the scleral conjunctiva, as large as a pinhead, with a purulent base, resembling the ulcer resulting from the breaking down of an eczema pustule. The margins of the ulcer were irregularly swollen, and the scleral conjunctiva was infiltrated over a considerable area and per-



vaded by greatly dilated vessels. About the ulcer and in the upper half of the scleral conjunctiva were numerous yellow infiltrations or nodules (Fig. 5).

The ulcer extended to the cornea and grew deeper, so that the superficial layers of the sclera and cornea broke down. There was a gradually increasing vascularization of the upper margin of the cornea about the ulcer. The aqueous was cloudy and there were deposits on the membrane of Descemet. The iris was scarcely discolored, the pupil dilated *ad maximum* under atropine, and the ophthalmoscopic examination revealed normal conditions in both eyes.

A general examination by Professor Matterstock led to the following diagnosis: sclerosis tonsillæ et arcus palatoglossi later. sin., angina luetica, condylomata lata faucium; syphilis cutanea papulo-squamosa, pustulosa, lenticularis et miliaris; polyadenitis.

Taking into account the general condition, the pustular ulcer of the scleral conjunctiva is to be designated as a papular syphilide becoming pustular, about which nodules formed of the same nature as those observed in Case 3.

Under inunction treatment the ulcer became clean, grew smaller, and healed without particular cicatrization. In three weeks' time all the other ocular symptoms disappeared and the signs of the disease elsewhere became less marked.

The same eruption appeared on the scleral conjunctiva that was found on the skin, and the fact that the pustular ulcer spread in lateral extent and in depth must be ascribed chiefly to the excessive anæmia and the reduced condition of general nutrition.

The development of nodules in the scleral conjunctiva about the ulcer is to be explained as in Case 3. The same explanation will account for the development of the iritis—that is, that a virus from the affected spot by means of diffusion acts upon the iris. In this case a diffusible poison extended in two directions, through the scleral conjunctiva and into the iris. In the former, the reaction of the tissues manifested itself in the appearance of nodules; in the latter, in the appearance of iritis and deposits upon the cornea.

Should further observations show that syphilitic disease of the conjunctiva, whether a chancre or a secondary eruption, is regularly accompanied by the formation of these nodules, the latter would be in doubtful cases of conjunctival

syphilis not only a valuable diagnostic sign, but the manner of their extension, the quickness of their appearance, the great number and the yellow color of the so-called follicles would permit the conclusion that the syphilitic virus not only is readily and quickly diffused in the conjunctiva; but also produces a severe reaction in its tissues.

**CASE 5.—Lues tuberosa serpiginosa of the skin of the lids, face, head, neck, thighs, and forearm that had run its course.** See Fig. 6, Plates I.–II.

W. H., a man of fifty-two; infection twenty-seven years before. Three or four years after infection, cutaneous eruption on both legs; ten years after, on both forearms; and three years ago, on the face, head, and neck.

The skin of head and neck exhibits a peculiar formation of cicatrices, consisting principally of broad white and moderately elevated tracts, forming a network (Fig. 6). In general these run, particularly in the face, in a vertical direction. In places the scars are broader and contiguous, having a great similarity to scars following burns. At the spots which are not cicatricial, the skin appears atrophic. On the neck the scars are considerably pigmented, but those of the head are only slightly pigmented. In general the skin is thin and velvety and is readily elevated. The right ear is deformed by cicatricial contraction.

The lids on both sides are involved, the right, however, more than the left. In the latter, the outer half of the upper lid is everted and the tarsal conjunctiva proliferated. Cilia are few in either lid. There is pannus of the cornea.

On the right side the entire upper lid and most of the lower lid are so everted that the entire tarsal conjunctiva with the retro-tarsal fold appears as a uniform mucous membrane turned forward and lying in a single plane. It is swollen and hyperæmic. The upper lid is so displaced that the lid margin lies at the upper margin of the orbit, nearly in contact with the eyebrow. The latter is itself drawn upward (Fig. 6A) and is represented by a few long black hairs more or less vertical in direction. The cilia are reduced in number until only a few are visible near the middle of the lid margin.

The scleral conjunctiva of the right eye is even more swollen and œdematous than the tarsal conjunctiva and retrotarsal fold.

It is thrown up about the cornea and partly overlaps the latter so that only its centre is visible (Fig. 6).

The cornea has been transformed into a uniform grayish scar traversed by many vessels.

Similar cicatrices are found on the anterior surface of the legs, the inner surface of the forearms, and about the elbow-joints.

Professor Lassar regards the condition as lues tuberosa serpiginosa (gummata of the skin) which has run its course.

*Explanation of Figures on Plates I.-II.*

Fig. 1, Case 2.—Herpes facialis of the right lower lid.

Fig. 2, Case 3.—Eczema impetiginosum necroticum of the upper and in part of the lower lid, with eczema on other parts of the face.

Fig. 3, Case 3.—Cured eczema impetiginosum necroticum of the upper and lower lids, with a chancre of the conjunctiva of the lower lid, a secondary ulcer on the corresponding part of the scleral conjunctiva, and numerous nodules scattered through the entire conjunctiva.

Fig. 4, Case 3.—The same as in Fig. 3; the lower lid margin transformed into an irregular scar with many subcutaneous nodules about it.

Fig. 5, Case 4.—Pustular syphilide of the face and scleral conjunctiva, with nodules in the conjunctiva about the ulcer.

Fig. 6, Case 5.—Healed lues tuberosa serpiginosa of the right half of the face, with consecutive ectropium of the lids. The swollen scleral conjunctiva surrounds the cicatricial cornea in a fold.

A indicates the elevated right brow recognizable from the presence of isolated hairs in the middle portion. The margin of the upper lid has been drawn up nearly to this point and exhibits a few remaining cilia.

## EPIPHORA AS AN INITIAL SYMPTOM OF BASEDOW'S DISEASE.

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Slightly Abridged Translation from Vol. XLVI., 2 (1902), German Edition, by  
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IT is known that in the beginning of Basedow's disease in many cases there is epiphora which annoys the patient very much. In exceptional cases the epiphora may become so troublesome at night as to disturb the patient's rest. Such cases have been reported by Schoch and Koeben, Fischer, Bäumlér, Roth, and Shingleton Smith.

Most authors, Schmidt-Rimpler for example, agree with Sattler that epiphora in Basedow's disease is due to two causes: 1, the wide palpebral aperture permitting the irritating atmospheric air to affect a great part of the anterior portion of the ball and thus excite an increased flow of tears; 2, the infrequent and incomplete closing of the lids, which leads to an imperfect carrying off of the tears. Other authors, for example Knies, believe that the epiphora is due to irritation of the sympathetic.

That the former explanation is not applicable to all cases is shown by two observations which I reported in 1893 (*Bulletin méd.*, No. 21, p. 241). In these cases the epiphora long preceded all other symptoms of Basedow's disease. Since then I have observed two other cases in which there was epiphora before the symptoms of a wide palpebral aperture or of infrequent winking appeared. The cases in which epiphora appeared as the initial symptom of Basedow's disease present so many interesting clinical features that it seems justifiable to report them.



CASE 1.—Frau Ch., aged fifty-five, of medium stature, greatly emaciated. No nervous diseases known in her family. Three years before, after a great sorrow, epiphora began, which led her to consult one after another a number of ophthalmologists here. In spite of the slitting of the canaliculus and probing, given up and repeated again, no improvement was obtained.

In October, 1892, the patient came to consult me in regard to the epiphora. There was bilateral exophthalmus which the patient stated had developed gradually recently. On each side there were blepharadenitis and injection of the conjunctiva. Pupillary reaction, accommodation, acuteness of vision, ophthalmoscopic appearance (except for arterial pulsation), normal. It was not possible to determine the field of vision. There was palpitation of the heart. Cardiac dulness increased, tachycardia, a feeling of anxiety, insomnia, increased sweating, and twitching of the extremities which had increased until the patient was unable to write. All these symptoms appeared later than the epiphora which persisted, although the probe passed readily through the nasal duct. The thyroid was but slightly enlarged.

Faradization of the sympathetic according to Vigouroux's method and the constant current (anode on the nape of the neck, kathode on the closed lids) were tried for several sittings without any perceptible result. At the same time a neurologist instituted the proper general treatment, but this was not continued long, since the patient was in the habit of changing physicians and methods of treatment frequently. Indirectly I learned that the patient gradually weakened and died.

CASE 2.—R., aged fifty-six, a merchant, of medium size, strongly built. No nervous diseases in the family. A chancre at the age of seventeen, cured by mercurial injections continued for months. At the age of forty-seven, diplopia came on and mercury and iodide of potassium were used freely. In three months the diplopia passed off. Since then the patient makes mercurial inunctions for a time each year and no manifestations of syphilis have appeared.

Four years ago he noticed epiphora in both eyes, which from time to time increased. He found no cause for this, but supposed it to be connected with a mentally depressing experience. An oculist who was consulted at that time split one canaliculus and passed sounds on each side daily. This treatment having pro-

duced no result in two weeks, the patient went to another oculist and then to others, employing all the usual methods of treatment, such as astringent injections, probing, etc. It was now supposed that the epiphora was due to reflex excitation from another organ and rhinologists were consulted, who stated that they did not believe the epiphora to be due to pathological changes in the nose. It was then proposed to the patient that the epiphora might be cured by the extirpation of the palpebral lachrymal glands. He did not consent to the operation and gave up all treatment.

Four years after the epiphora began he came to me because he had noticed that for some time both eyes protruded slightly. When I first saw him I found a slight exophthalmus, more pronounced on the left side than on the right. While the patient was relating his history he was constantly obliged to wipe away the tears.

On each side the tendon of the levator was retracted, Graefe's symptom, which was not well marked but later became clearly evident. Winking infrequent, slight inflammation of the lid margin and conjunctiva. Pupils of average width and reacting to light and in convergence. Acuteness and fields of vision and ophthalmoscopic appearance normal. A Bowman's probe No. 6 could readily be passed on either side.

On questioning the patient I learned that he had noticed palpitation of the heart for some time but paid little attention to it. The pulse was over 100, and he complained of a feeling of heat and increased sweating.

I regarded his condition as a case of beginning Basedow's disease, of which epiphora was the initial symptom. For general treatment I referred him to a neurologist. The general condition improved, and with this the epiphora became less annoying.

CASE 3.—Mrs. R., aged fifty-six, small, of robust figure, and anæmic appearance. Parents died early; four brothers and three sisters healthy. Married at the age of seventeen, and had nine children. One died at the age of two and one at the age of four from convulsions, one from cholera, and one from an infectious disease while in the military service. A daughter was under my care for a convulsive tic.

Three years ago, while grieving over the death of a son, a number of nervous symptoms appeared: disturbed feeling, insomnia, asthenopia. For two years the patient has had attacks of fainting and difficulty in breathing. For a year there has been

severe palpitation of the heart, a feeling of pressure on the breast, and a feeling of anxiety. Epiphora has existed since the beginning of her illness, appearing at times, often being very troublesome, and always affecting both eyes.

The palpebral aperture and the frequency of winking are not abnormal. There is no exophthalmus; Graefe's symptom. Binocular convergence difficult. In order to read at 33cm the patient requires + 1.5 combined with prisms. Pupils, fields, and fundus normal. R V =  $\frac{2}{20}$ , L V =  $\frac{2}{20}$ . Lachrymal passages normal. Heart-beat strong, the apex beat to be felt as far as the anterior axillary line; systolic murmurs; pulse, 100-105. Marked pulsation of the carotids. Pronounced sweating and annoying polyuria.

CASE 4.—H. S., aged forty-seven, tall and haggard. In childhood he had measles and varicella, and was always neurasthenic. In 1894 he had influenza, followed by symptoms indicating empyema of the left frontal sinus, but not necessitating surgical procedures.

In 1896, suddenly, epiphora began in the right eye, while the patient was riding on a car. When examined the following day I found no epiphora nor any other anomaly of the eye. Since then, at intervals, two attacks of dacryorrhœa have come on, which led me to believe that there was a secretory neurosis of the lachrymal gland. An examination of the nose revealed nothing abnormal, and there were no symptoms of tabes (there had never been syphilis) or of hysteria.

The attacks of dacryorrhœa continued without any accompanying symptoms up to the year 1899, usually in the right eye, sometimes in the left, and often in both eyes together. Their intensity and duration varied greatly. I observed one attack in which the tears flowed drop by drop down over the right cheek.

On December 2, 1899, the patient had a severe emotional shock. The following night he was sleepless and had palpitation (which he had had earlier), marked pulsation of the carotids, epiphora, and polyuria. Then gradually the typical picture of Basedow's disease developed: tachycardia (pulse, 100-120), arrhythmia, vertigo, difficulty in breathing, a feeling of anxiety. After bodily exertion he had a feeling of heat and increased pulse. His sleep was disturbed, and he frequently awoke with pulsating carotids and tears in the eyes. Frequent examination of the eyes revealed nothing abnormal. There was present neither Graefe's



nor Stellwag's symptom, binocular convergence was difficult, and reading tiresome. Exophthalmus was never observed.

In consultation with the attending physician I was unable to convince him that this was a *forme fruste* of Basedow's disease, but later he agreed in the diagnosis when, in the spring of 1900, a swelling of the thyroid became manifest. The treatment consisted in cold applications to the region of the heart, iodide of potassium, psychical hygiene, and abstinence from alcohol and tobacco, by which the condition was greatly improved. The palpitation passed off gradually, and at the same time the epiphora became less frequent and intense. Since then, excessive exercise had brought on occasional relapses, but in general his condition has been good.

In all the cases observed by me, the epiphora appeared without any other symptoms in the eye or other organs which could explain it, and the usual signs of Basedow's disease came on years later.

Professor Verneau and Dr. Diamantberger have described similar cases to me.

It is evident that in these cases the epiphora is not due to excessive width of the palpebral aperture (retraction of the levator, exophthalmus), which, though allowing the exposure of a greater portion of the ball to irritating influences, might cause epiphora; nor is this due to the infrequency of winking, since in every case the epiphora preceded this symptom.

Furthermore, the epiphora may continue even after the exophthalmus has passed off. An interesting case of this sort was observed by MATHIEU.

L. N., aged twenty-five, an engraver. His father died of heart disease; his mother is still living, but has goitre. As a child, the patient suffered from convulsions. At the age of 4-5 years, there was transitory convergent strabismus of the left eye.

At the age of fifteen, the patient noticed the first symptoms of Basedow's disease. The exciting cause was emotional excitement due to his narrow escape in a fire.

At the time of examination, there was twitching, diarrhœa, tachycardia; pulse 100, irregular, and intermittent. For five



years there has been no exophthalmus, but the epiphora continues as before. The eyes are constantly bathed in tears, yet these rarely flow down the cheeks. The epiphora came on with the exophthalmus.

In these cases the epiphora is to be regarded as a secretory neurosis of the lachrymal glands similar to the other secretory neuroses found in Basedow's disease, such as increased sweating, polyuria, etc. The lachrymal gland is innervated by the facial, to which is attributed the increased secretion from psychical causes, and the sympathetic. The weeping, caused through the fifth nerve, is to be explained as being due to a reflex conduction of sensory excitation to the sympathetic vasomotor fibres in the glands.

The acceptance of a vasomotor neurosis to explain the epiphora in Basedow's disease accords fully with the usual interpretation of a series of symptoms in this disease as being due to the sympathetic (Koeben).

The diminished secretion of tears which is noted in most cases of Basedow's disease, particularly when of long standing, has not yet been satisfactorily explained.

Von Graefe believed the diminution of the lachrymal secretion to be due to compression of the gland from the exophthalmus. Sattler supposed that on the one hand the diminished sensibility of the cornea and conjunctiva lessened the reflex secretion, and that on the other the extent of the eyeball exposed led to a more rapid evaporation of the tears, and hence decreased the moisture of the ball.

A case of Basedow's disease in a woman of fifty-two which I observed, in whom the unpleasant symptom of dryness of the eye appeared as the exophthalmus improved, seemed to indicate that in certain cases at least a diminution of lachrymal secretion and not an increased evaporation gives rise to the sensation of dryness.

Anatomical examinations of the lachrymal glands in Basedow's disease are, so far as I know, entirely wanting. It would be interesting to learn whether the changes in the lachrymal glands in dacryorrhœa, which are essentially similar to the changes found by Klippel and Lefas in the sali-

vary glands in the sialorrhœa of tabic patients, also exist in Basedow's disease. These changes consist in a fatty degeneration and necrosis of the gland cells, circumlobular sclerosis, and mild inflammatory changes in the ducts of the glands. The adherents of the toxic theory of Basedow's disease may explain the diminution of lachrymation by assuming toxic changes in the nerves of the glands.

The cases of Basedow's disease with epiphora as an initial symptom are rare, yet in many cases the early appearance of epiphora, followed later by the other symptoms, may have been overlooked. From a diagnostic standpoint the epiphora, so long as other symptoms do not exist, offers nothing characteristic. But when to an epiphora is added tachycardia, marked pulsation of the carotids, and the like, as in my Case 4, the ophthalmologist may render considerable service by early recognizing the existence of the general disease, as the results of treatment are better the earlier the diagnosis is made.

It is evident that in the treatment of epiphora when it is a secretory neurosis, sounds and astringent injections are not to be used. Nor even in obstinate cases would I extirpate the palpebral lachrymal gland when the appearance of other symptoms showed that Basedow's disease existed, for there is frequently diminution in secretion in the later course of the general disease, and this operation would cause the annoying feeling of dryness in the eye to become more manifest. I have had no experience in the local use of the constant current. The most important thing is the general treatment whereby the different symptoms of Basedow's disease, as well as the epiphora, are improved (*cf.* Cases 2 and 4). In very obstinate cases perhaps instillations of cocaine into the conjunctival sac might be tried, or the internal use of atropine, which, as we know, reduces the secretion of acinous glands.

For the annoying dryness of the surface of the ball I suggested in 1894 the replacing of the lachrymal liquid with sterilized salt solution instilled several times a day into the conjunctival sac, and this has been used with good result by others as well as myself.

## EXPERIMENTS ON ENDOGENOUS INFECTION OF THE EYE.

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FROM THE CLINIC OF PROF. L. BELLARMINOFF.

Translated from *Arch. f. Augenheilk.*, xlvii., April, 1903, by Dr. MATTHIAS  
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THE subject of endogenous infection of the eye, indeed of endogenous infection in general, has been studied only recently in a truly scientific manner. Long before the discovery of bacteria, clinical observations were made which indicated endogenous infection as the presumable cause of certain diseases of the eye, and, simultaneously with the perfecting of the microscope, in the middle of the nineteenth century, pathological and later bacteriological investigations of the subject were instituted. But experimental study dates back only five years, the number of workers is limited, many aspects have not as yet been touched upon, and so we have undertaken a series of experiments in the hope of throwing some light upon the obscurities of a subject so important in the pathology of the eye. In order to make the purpose of our work clear, we quote not only the experimental work which has already been done, but the ascertained clinical and anatomical facts as well. The latter we mention briefly because they have been sufficiently elaborated in the writings of Axenfeld, Herrnheiser, and others.

### CLINICAL FACTS.

Clinical experience leads to the classification, on the one



hand, of general and local infections which endogenously cause eye diseases, and, on the other, of the forms in which the latter appear. The first observations, at the beginning of the nineteenth century, were made in regard to disease of the eye from puerperal infection. In the course of fifty years, similar cases were reported as the results of pyæmia of all kinds, caries of bone, and umbilical phlebitis, and with the better understanding of general infectious diseases came the knowledge that they, too, can cause eye troubles. It is now known that there is no general infection in which resultant diseases of the eye have not more or less often been observed; they have been seen in erysipelas, acute exanthemata, diphtheria, typhoid, typhus, relapsing fever, influenza, acute and chronic rheumatism, tuberculosis, lues, lepra, malaria, epidemic meningitis, Weil's disease, etc. It is also known that endogenous disease of the eye may be caused by bacterial diseases of single organs, such as croupous and broncho-pneumonia, purulent bronchitis and pleurisy, fibrino-purulent endo- and pericarditis, otitis media, catarrh of the stomach and of the bladder, and gonorrhœa. In 1888 Ewetzky reported a case of panophthalmitis due to endogenous infection from a paronychia.

Some writers attribute to endogenous infection, in spite of the absence of a general or local infectious disease, the severe purulent inflammations which sometimes follow the formation of anterior synechiæ after ulcerative keratitis, iridectomy, or cataract extraction, especially when associated with a cystoid cicatrix. The idea is that these inflammations arise through endogenous infection of the scar as the place of least resistance, and is based on the fact that in many cases it has been impossible to demonstrate any external lesion even with the microscope and ectogenous infection was thereby excluded, but the location of the focal point in these cases has not yet been determined.

Panas goes farther and thinks that plastic and serous inflammations of the uvea and retina can be caused by the transmission of microbes from any part of the body, such as the intestinal canal or the urinary organs, when the appearance of the eye is normal and the general health seems



to be good. Even if this is going a little too far we must not forget that the cause of idiopathic iritis is still unknown.

The forms in which endogenous infection of the eye appears may be divided into diseases of the eyeball and optic nerve, and diseases of the surrounding tissues, such as paralyzes of the extrinsic muscles, and inflammation of Tenon's capsule. The first group includes functional troubles, such as paralysis of the accommodation, amblyopia, and amaurosis without organic changes, as well as the far more important inflammatory diseases, iritis, irido-cyclitis, irido-choroiditis, iritis with the formation of nodules in syphilis, tuberculosis, and lepra, various forms of choroiditis and retinitis, papillitis, neuroretinitis, retrobulbar neuritis, and finally the very malignant metastatic ophthalmia. Therefore all the endogenous diseases of the eye as yet observed can be otherwise divided into two groups, the mild forms which end in complete recovery and the severe ones which result in loss of sight; between these extremes are transition forms which cause a greater or less functional loss. In this connection it is noteworthy that the mildest as well as the most severe inflammation of the eye can be excited by each of all the general and local infections with no reference to their severity.

These are the results of clinical observation. They leave many things obscure. The manifold nature of these diseases, with their varying courses and results, seems to indicate that almost all known diseases of the eye can be produced by the introduction of bacteria. The action of toxins and the weakening of the tissues as the consequence of general infection may be thought of, but even if we grant that all functional disturbances of the eye arise thus indirectly, there remain many inflammations which must be ascribed with probability, though not with certainty, to endogenous infection with bacteria on account of their clinical course. Clinical observation gives just as little certainty as to the precise manner of origin of infections of the eye, the primary local point of infection, the cause of the varying severity of the inflammations, or the conditions on the part of the eye or of the general system which favor or hinder endogenous

infection. Some of these points were partially cleared up by the pathological and bacteriological investigations.

PATHOLOGICO-ANATOMICAL AND BACTERIOLOGICAL FACTS.

In 1856 Virchow ascribed the cause of metastatic ophthalmia to capillary embolism from the pathological conditions he found to be present in a case of this nature. This was soon confirmed by many other investigators, who all, as well as Virchow, found in the emboli certain little bodies which were very resistant to the action of various chemical reagents. Heiberg pronounced them to be bacteria in 1874 and later studies proved him correct.

These investigations refer almost entirely to metastatic ophthalmia, or endogenous purulent panophthalmitis. Besides purulent, or fibrino-purulent infiltration of the tunics of the eye, emboli are usually found in the vessels, especially the fine capillaries, formed from fibrin, pus cells, and bacteria, or from the last alone. Inflammatory and necrotic changes, sometimes destruction, are almost always to be seen in the walls of the thrombosed vessels, and bacteria can always escape into the neighboring tissue, so that a thrombosed capillary often becomes the starting-point of an abscess. The constant presence of emboli containing bacteria, and the inflammatory reaction in their neighborhood, indicate that the formation of these emboli is the immediate cause of the disease of the eye.

The sources of capillary emboli are septic endocarditis and thrombophlebitis, the conditions which favor their formation are previous thrombosis without bacteria in the vessels of the eye, various degenerative processes in the vessel walls, and the smallness of the vessels themselves, with absence of collateral circulation in the retina. When bacteria are found in vessels with unchanged walls they have been circulating in the blood, in Axenfeld's opinion, and they sometimes multiply *post mortem*.

Whether bacteria can escape into the neighboring tissue through apparently unharmed vessel walls has not been determined by researches of this nature.

With regard to the location where the primary embolism occurs few observations have been or can be possible, because a microscopical examination is usually made on eyes which have been destroyed by inflammation, and then there is no possibility of finding the primary focus. In the paper of Axenfeld, 46 cases of metastatic ophthalmia are collated in which the primary focus was determined: in 21 it was in the retina, in 18 in the choroid, in 5 in these tissues conjointly, and in only 2 in the iris. Almost all authors agree that the choroid and retina form the usual starting-point in the severer forms of endogenous infections of the eye.

Relatively few observations have been made as to the character of the bacteria found in the eye if those obtained through cultures are considered alone as unquestionable. Axenfeld quotes 50 cases in which the results had been thus obtained: in puerperal and pyæmic metastatic ophthalmia, streptococcus pyogenes was found 21 times, staphylococcus pyogenes 8 times; in diseases of the eye caused by cerebro-spinal meningitis and croupous pneumonia, Fraenckel's diplococcus was found 8 times; in 2 cases due to typhoid fever, Ebert's bacillus was found; in 1 from typhus, a bacterium similar to that described by Hlava; in several from influenza, Pfeiffer's bacillus. Some authors, on account of the negative results of their investigations, ascribe the origin of the endogenous disease, in certain cases of septic retinitis and purulent inflammations, to the entrance of toxins made by bacteria elsewhere in the body. Such a theory is *a priori* admissible, but it must be considered that the absence of bacteria was asserted by some of these authors after microscopical examination alone, and also that in some cases of septic retinitis bacteria are found in the eye. Yet a few cases of endogenous eye disease have been reported in which the absence of bacteria was demonstrated by cultures as well as by the microscope.

The important facts learned from investigations of this nature may be thus stated:

1. The cause of the worst form of endogenous eye disease, metastatic ophthalmia, is the formation of bacterial emboli in



the vessels of the eye, principally in those of the retina and choroid.

2. All organic changes in the vessel walls which facilitate the formation of capillary emboli are to be considered factors favorable to the commencement of an endogenous infection of the eye.

3. In some cases the bacteria which caused the general infection have been found in the eye, an indubitable proof of the endogenous character of the disease.

4. It is evident that these methods of investigation can play only a limited part in the elucidation of this subject. They can very rarely, if ever, be applied to mild forms of disease, or even to some forms which are destructive to vision, and yet these occur much more frequently than metastatic ophthalmia.

#### PREVIOUS EXPERIMENTS.

In 1864, Weber observed a suppurative metastatic irido-choroiditis in two cats after injection into their blood of unfiltered pus from a suppurating joint. Microscopic examination of the enucleated eyes revealed capillary embolism in the ciliary bodies and retinae. Twenty years later, Marchand obtained an almost identical result from the injection into the blood stream of a pure culture of pneumonia diplo-bacillus. In 1897, Ewetzky described a case of serous irido-cyclitis in an ass, which appeared two weeks after the experimental production of relapsing fever. The case recovered, hence no microscopic examination was made.

These partially accidental observations apparently brought nothing new to light, but when we consider the great number of experiments made with regard to general infection it is quite evident that general infection alone will rarely cause endogenous disease of the eye.

During the last five or six years, several attempts have been made to obtain a suitable and simple method of investigation of endogenous affections of the eye, not to produce metastatic ophthalmia, but to study the conditions which favor the entrance of bacteria. The first attempt in this direction was made by Panas, who injected three rabbits



intravenously with pure cultures of bacillus coli or pyocyaneus, and either before or after the injection instilled some drops of nicotine and acetic acid into the eye. In every case he was able to find the injected bacilli in the aqueous, and came to the conclusion that bacteria circulating in the blood can easily enter an irritated or inflamed eye. Moll's experiments in regard to the passage of bacteria from the blood into the anterior chamber gave these results: In a normal or unirritated eye the bacteria penetrated into the aqueous only when there was a very severe general infection, and in only 23 % of such cases. In eyes irritated by the introduction of foreign bodies, or croton oil, or by the cauterization of the limbus corneæ, the bacteria appeared in the aqueous in 78 % of the experiments, even when a weak culture had been used. In the successful experiments the number of microbes found in the aqueous of the irritated eyes was much greater than that found in the aqueous of those which were normal. The bacteria in the anterior chamber caused no clinical symptoms, whence Moll concluded that they had retained their vitality but not their pathogenic power.

One of us, Selenskowsky, undertook some experiments in 1899 and 1900, published elsewhere, to ascertain if possible, among other things, whether irritation of the eye really favored the entrance of bacteria into the aqueous; whether microbes circulating in the blood pass also into the vitreous; and how to explain the absence of clinical inflammatory ocular symptoms in spite of the presence of bacteria. Moll's observations in regard to the influence exerted by mechanical, chemical, thermic, and electric irritations of the eye upon the frequency of entrance of bacteria into the anterior chamber and the number of bacteria found therein were confirmed by every one of the experiments. The frequency with which bacteria were found in unirritated eyes was about 30 %; in the irritated, about 80 %. In none of these experiments did the bacteria in the anterior chamber produce any visible changes.

Taking into account corresponding researches, this writer decided that the number of bacteria which gain entrance to

the aqueous is proportionately small ; that their virulence, as compared with that of the injected culture, is greatly diminished ; and that they escape very quickly from the anterior chamber, for the most part within twenty-four hours. Perhaps the early commencement of phagocytosis is to be added to the limited number of bacteria and their rapid removal in the lymph stream through the filtration angle to account for this quick escape. These are conditions which give the bacteria that enter the anterior chamber, so to speak, no time in which to exhibit their virulence, even though their pathogenic power as well as their vitality has been retained.

In none of the experiments was the passage of bacteria from the blood into the vitreous observed, but, as shown by the experiments of Bach, the vitreous must be acknowledged to be a favorable soil for the stay and development of bacteria on account of the very weak lymph circulation. In all these experiments cultures of moderate virulence were used in moderate quantities, so that none of the animals died from the infection.

#### OUR OWN EXPERIMENTS.

Our experiments were undertaken to try to answer these questions :

1. Is it possible under any conditions to force bacteria circulating in the blood into the vitreous?
2. If it is possible, do they enter from the anterior part of the eye or from the general circulation?
3. How do they enter each part of the eye?
4. Does the apparent absence of clinical changes as the result of the presence of bacteria in the anterior chamber correspond to absence of any microscopic lesion? If such a lesion exists, of what sort is it?
5. Is it not possible by modification of some conditions in our experiments to induce the production of clinical changes in the eye?

Questions 1 and 5 give rise to these additional questions:

6. What is the effect of irritation not only of the anterior but also of the posterior part of the eye?

7. What effect is produced by the injection into the blood of greater and lesser quantities of the same culture, and what by injections of cultures of greater or less virulence?

We considered that the influence of irritation of the eye upon the passage of bacteria into the anterior chamber had been fairly settled and therefore made no comparative experiments in that direction, although in all cases we examined the aqueous for the presence of bacteria.

Forty-seven experiments were made on rabbits and cats, thirty-nine with, eight without, irritation of the eye. Both eyes were irritated in three cases, in all the others one eye was left to serve as a control. The irritation of the anterior part of the eye was excited by cauterization of the limbus corneæ, by the introduction, in three cases only, of a piece of steel into the anterior chamber without injury to the iris, or by causing a prolapse of the iris. In the posterior part of the eye a foreign body was introduced into the vitreous through the smallest possible opening, and only when this caused no bleeding, as determined not only by a careful ophthalmoscopic examination, but also finally by a microscopic, was the experiment considered successful. To obviate the objection that the bacteria might enter the vitreous through vessels cut in introducing the foreign body, in some of the experiments the general infection was induced several days later.

The following bouillon cultures of various ages and virulence were used to induce the general infection: in thirty-five experiments the  $\alpha$  variety of bacillus pyocyaneus, in nine the staphylococcus pyogenes aureus, and in three the streptococcus pyogenes. The original virulence of the first two cultures was such that 1ccm of a one-day's culture to a kilogram in weight killed a grown rabbit in about twenty-four hours. The weakening of these bacteria was accomplished by repeated inoculations in bouillon-peptone-agar, or by a prolonged stay in an incubator. The virulence of the streptococcus culture was such that 1ccm of a one-day's culture to a kilogram produced no severe symptoms beyond a rise of the temperature to 40° C. The cultures were injected into a vein in the margin of the ear in rabbits, into a super-



ficial vein of the lower extremity in cats. The quantity injected was from 2 to 4ccm each time.

The inoculations from the aqueous and vitreous were obtained, after intervals of time varying from one to ninety-seven hours, by means of a Pravaz syringe, in quantities of from 0.1 to 0.2ccm., and were made on Petri's dishes. In some experiments we examined microscopically a portion of what was withdrawn from the aqueous and vitreous for the presence of bacteria and of phagocytosis. Repeated inoculations from the blood were also made. At the end of the experiment the animal, if living, was killed and inoculations were made from the liver, spleen, kidneys, brain, and blood of the heart. Whenever the presence of bacteria was demonstrated in the aqueous or vitreous, the eye was enucleated after a varying period of time, hardened, embedded in celloidin, cut into sections, properly stained, and examined with the microscope.

Our work may be divided into five sections, which correspond to the questions above stated.

1. General infection with antecedent, simultaneous, or subsequent irritation of the anterior portion of the eye.
2. General infection with irritation of the posterior portion of the eye.
3. General infection with simultaneous or consecutive irritation of both portions of the eye.
4. General infection without irritation of the eye.
5. Microscopic examination of the sections of the hardened eyeballs.

#### EXPERIMENTS WITH IRRITATION OF THE ANTERIOR PORTION OF THE EYE.

Twenty-one rabbits were experimented on in this manner. Three of these died before any inoculations were made; in sixteen, frequently repeated examinations of the vitreous with inoculations and the microscope from two to seventy-two hours after the production of general infection failed to reveal any trace of bacteria, although they were present in the aqueous in several cases; in two, positive results were



obtained. As the last are of much interest, the experiments will be briefly detailed.

*Experiment A.*—Rabbit, weight 1.5 kilo. Cauterization of the left limbus corneæ. Half an hour later, intravenous injection of 1.5ccm of a one-day-old culture of bacillus pyocyaneus of moderate virulence.

Inoculations from the blood after fourteen, nineteen, twenty-four, and thirty-seven hours, from the aqueous of both eyes after twenty-four hours, and from the vitreous of both eyes after twenty-four and one half hours, gave negative results. After thirty-seven and one half hours, inoculations from the left aqueous, and after thirty-eight hours from the left vitreous, resulted in innumerable colonies of bacillus pyocyaneus, while those from the right eye were negative.

*Experiment B.*—Rabbit, weight 1.4 kilo. Cauterization of left limbus corneæ and a part of the cornea. Half an hour later intravenous injection of 3ccm of a one-day's culture of bacillus pyocyaneus.

Twelve and twelve and one half hours later, inoculations from and microscopical examination of the aqueous from both eyes and of the vitreous of the right eye gave negative results, while the bacillus pyocyaneus was demonstrated to be in the left vitreous. Under the microscope free bacilli were seen with a sparse quantity of mononuclear leucocytes. At the end of twenty-four hours, the animal showed symptoms of a severe general infection and was very weak. Inoculations showed bacilli in the aqueous of both eyes, while the microscope revealed none in the right, and four or five free bacilli in the left. Inoculations from the vitreous of each eye at the end of twenty-five hours showed bacilli in both; the microscope revealed none in the right, but many free bacilli and mono- and polynuclear leucocytes in the left. Death occurred from the general infection at the end of thirty hours.

In this group of experiments what caused such a very small number of positive results? There are three possible answers: 1. That the bacteria injected into the blood disappear so quickly that they have, so to speak, no time to pene-

trate into the vitreous; 2. That the microbes which had entered the eye had escaped before any of the vitreous was taken out; 3. That for some reason the vitreous shows little attraction to bacteria, even when they are circulating in the blood. The first two of these possible answers are evidently excluded in most cases, not only in this group of experiments, but also in the two following. Experiment A, and other experiments as well, showed that the bacteria can disappear from the circulation and subsequently enter the eye, apparently from some inner organ. In Experiment A the bacteria were found in the vitreous of the irritated eye alone, but in Experiment B they were found in the vitreous of both eyes, though earlier in that of the irritated one, so that the entrance of the microbes into the sound eye, and perhaps also into the other, is to be ascribed rather to the virulence of the culture employed than to the irritation. This idea is supported by the results of some of our other experiments.

From this group we draw the following conclusion :

With a weak or moderate general infection, the passage of bacteria circulating in the blood into the vitreous is much impeded by some conditions present not only in normal eyes but also in those in which the anterior segment has been irritated, a condition which highly favors the entrance of the same bacteria into the aqueous.

#### EXPERIMENTS WITH IRRITATION OF THE POSTERIOR PORTION OF THE EYE.

For these seven experiments on rabbits bouillon cultures of bacillus pyocyaneus of varying virulence were used. A foreign body was introduced into the posterior part of the eyeball. In five of these experiments from 1 to 1.5ccm of a one to four days' culture was injected, a comparatively mild general infection was produced, and the results of the examinations of the vitreous were negative. In two experiments positive results were obtained. In one of these a successful inoculation from the vitreous of the injured eye was secured after twelve and a half hours, at which time the

aqueous of the same eye, as well as the aqueous and vitreous of the other eye, was found to be sterile. The other was as follows:

*Experiment C.*—Rabbit, weight 2.4 kilo. Introduction of a piece of steel into the left vitreous. Three days later, intravenous injection of 2ccm of a two-days' culture of staphylococcus pyogenes aureus. On the following day severe general infection, positive results from inoculations from the blood and left vitreous, negative from the right vitreous and the aqueous of both eyes. Death in twenty-seven hours. Positive results from inoculations from the liver, spleen, kidneys, medulla, and blood of the heart.

In these two cases the bacteria entered into only the wounded portion of the injured eye. This probably indicates that irritation of the posterior part of the eye favors the passage of bacteria into the vitreous, but such a passage occurred only in connection with a severe general infection. It may therefore be asserted that even in the presence of irritation of the posterior portion of the eye the passage of bacteria from the blood into the vitreous is greatly impeded when the general infection is mild or of moderate degree, and that a certain degree of severity of the latter is necessary to cause such irritation to favor effectively the passage of the bacteria.

#### EXPERIMENTS WITH IRRITATION OF BOTH PORTIONS OF THE EYE.

Eleven of these experiments were made. Six failed to show a passage of the bacteria into the vitreous. In these 1.5 to 2ccm of a one to three days' culture of bacillus pyocyaneus, or 1 to 1.5ccm of a three-days' culture of staphylococcus pyogenes aureus, were injected without producing severe general infection. In the five successful experiments the culture of bacillus pyocyaneus alone was used in four, while in the remaining one the same culture was used at first and later a culture of staphylococcus pyogenes aureus. In three of these the presence of the bacteria was demonstrated in the injured eye alone, twice in both aqueous and vitreous, once only in the vitreous; in the other two they were pres-



ent in the other eye as well. The last two and one of the others seem worthy of a more detailed description.

*Experiment D.*—Rabbit, weight 1.6 kilo. Introduction of a foreign body into the posterior portion of the left eye. Immediate intravenous injection of 1.5ccm of a one-day's culture of bacillus pyocyaneus. Inoculations from the blood and the aqueous and vitreous of both eyes after twenty-four, forty-eight, and seventy-two hours gave negative results. Three days after the beginning of the experiment, the lower half of the limbus corneæ was cauterized and 2ccm of a one-day's culture of bacillus pyocyaneus were injected. On the next day there was haziness of the left cornea with little fibrinous deposits in the anterior chamber. Inoculations from aqueous, vitreous, and blood gave negative results. The next day there were œdema and swelling of the lids, with exophthalmos, cloudiness of the aqueous, discoloration of the iris, a contracted pupil which did not react to light, symptoms of a commencing panophthalmitis. Inoculations from the blood, the right vitreous, and the aqueous of both eyes gave negative, from the left vitreous positive, results. The next day the symptoms of the left eye were worse, with muco-purulent secretion from the lids. Inoculations from the right aqueous and vitreous were negative, from the left aqueous and vitreous positive. The microscopical examination of the left vitreous revealed many mono- and polynuclear leucocytes and four or five bacilli enclosed by leucocytes on each slide. The animal was killed seventy-two hours after the second injection. Negative results were obtained from inoculations made from the liver, spleen, kidneys, and blood of the heart. Microscopical examination of sections of the hardened eye showed abundant infiltration of cells in all the tunics of the eye, especially the retina, and a fibrino-purulent exudate in the aqueous and vitreous. Between the ciliary processes, and to a less degree in the ciliary vessels, were many bacilli, part of them free, part enclosed in mono- or polynuclear leucocytes and in destroyed pus cells. There was an innumerable number of bacilli in the tissue and vessels of the retina and choroid, almost all in the grasp of leucocytes.



*Experiment E.*—Rabbit, weight 2 kilo. Intravenous injection of 2ccm of a one-day's culture of bacillus pyocyaneus and cauterization of the lower half of the limbus corneæ. On the next day, inoculations from the aqueous and vitreous of both eyes and from the blood gave negative results. On the following day, there was found a diffuse cloudiness of the lower half of the left cornea, hyperæmia of the iris, and little fibrinous deposits in the anterior chamber. Inoculations from the blood and the left vitreous gave positive results, from the aqueous of both eyes and the right vitreous negative. A foreign body was then introduced into the posterior portion of the eye and another injection of 1.5ccm of a one-day's culture of bacillus pyocyaneus made. Ten to eleven hours later, inoculations from the blood and the right aqueous and vitreous gave negative results, from the left aqueous and vitreous positive. The next day, the general condition of the animal was good, the lids of the left eye were swollen, and the aqueous cloudy. Inoculations from the blood and right vitreous were negative, from the left vitreous and the aqueous of both eyes positive. The next day, there were œdema and great infiltration of the lids of the left eye, exophthalmos, muddy iris, contracted pupil, cloudy media, panophthalmitis. Inoculations, fifty hours after the second infection of the animal, from the blood and right vitreous negative, from left vitreous and the aqueous of both eyes positive. Microscopical examination of the left vitreous showed many bacilli free and enclosed in leucocytes. The animal was killed fifty-seven hours after the second injection. Inoculations from the liver, spleen, kidneys, and blood in the heart gave negative results. Microscopical examination of sections of the hardened eye showed a cellular infiltration of the tunics of the eye, a fibrinous exudate with pus cells in the anterior portion of the eye, a fibrino-purulent exudation in the vitreous and between the detached retina and choroid, many bacilli in the different parts of the ciliary body, chiefly about the vessels, and very many bacilli in the choroid and retina, sometimes even in the vessels. Most of the bacteria were enclosed in cells.

*Experiment F.*—Rabbit, weight 2 kilo. Introduction of a

foreign body into the posterior portion of the left eye. Two days later, intravenous injection of 2ccm of a one-day's culture of bacillus pyocyaneus. Inoculations from the aqueous and vitreous of both eyes twenty-four, forty-eight, and seventy-two hours after the injection gave negative results. Three days after the first injection, the lower half of the left limbus corneæ was cauterized and a second injection made of 2ccm of a one-day's culture of bacillus pyocyaneus. Inoculations from the blood and from the aqueous and vitreous of both eyes twenty-four and forty-eight hours later gave negative results. Four days after the second injection, 2ccm of a three-days' culture of staphylococcus pyogenes aureus were injected. Three hours later, inoculations from the blood and the aqueous and vitreous of both eyes gave positive results, the staphylococcus being present in all. The animal died nineteen hours after the injection of the staphylococcus culture.

Two conditions in Experiments D and E, which produced similar results, deserve consideration. The bacteria appeared first in the vitreous and later in the aqueous, corresponding to the succession of injuries to the two parts of the eye. This may have been due to the gradually increasing influence of the two injuries, or it may have been that the bacteria which had entered the vitreous multiplied and passed by continuity into the anterior portion of the eye. The other condition was that the entrance of the bacteria coincided with severe clinical symptoms, in which respect these two cases differed from all the rest of the experiments. Many times single symptoms were present, such as distension of the blood-vessels, or little fibrinous deposits in the anterior chamber, but these could be attributed to the irritation, or to our manipulations of the eye, while here we had panophthalmitis, confirmed by microscopical examination. Although in these experiments the same manipulations were made, the inflammation must be attributed to the microbes which had entered the eye, because of the exclusive presence in the eye of the culture injected into the blood and the extensive phagocytosis. It should be noted also that in these two cases the retina was the part of the

eye most involved and contained the largest number of bacteria.

In Experiment F, the second injection of the pyocyaneus culture did not induce entrance of the bacteria into the eye, probably because it disappeared very quickly from the blood, but in three hours after the injection of the more virulent staphylococcus culture, which also remains more persistently in the blood, the cocci had entered the eye.

The fact that in Experiments D and E the bacteria entered the uninjured eye also may be explained either by the unavoidable injuries occasioned by the frequent removal of portions of the humors of the eye, or by the greater virulence of the culture used, but we are not in a position to agree with Moll that the irritation of one eye favors the entrance into the other of bacteria circulating in the blood.

From this group of experiments we draw the following conclusion:

With a weak or moderate general infection, the simultaneous or consecutive irritation of both portions of the eye favors the entrance of bacteria more than the irritation of either portion alone. With a certain virulence of the culture, the germs thus introduced can excite clinical inflammatory symptoms.

#### EXPERIMENTS WITHOUT IRRITATION OF THE EYE.

These were undertaken to determine whether a severe general infection is sufficient to cause the passage of bacteria circulating in the blood into an uninjured eye. The general infection was obtained in two cases by the injection of a large quantity of a culture of medium virulence, in one by repeated injections of a culture of medium virulence of bacillus pyocyaneus, followed by an injection of a very virulent culture of staphylococcus pyogenes aureus, and in three by the injection of *2ccm* of the latter culture. The first two and one of the last three gave negative results, though death occurred in from eighteen to twenty-five hours. Yet in two other cases in which the general infection was milder the bacteria were found in the aqueous of both eyes, which



proves that with a mild infection bacteria can enter the aqueous, though not the vitreous.

In the three remaining experiments in which the very virulent culture was used, the presence of the bacteria was demonstrated in both vitreous and aqueous after twenty-nine, fifty-six, and seventy-two hours respectively.

To forestall the objection that the repeated withdrawals of vitreous favored as an irritation the entrance of microbes into the eye, the inoculations were made only once in this group of experiments, ten to seventy-two hours after the injection of the culture, and the result of this inoculation was held to be final. This proves that the positive results obtained were caused by the influence of the injected culture alone.

From these experiments we learn that the severity of the general infection favors the passage of bacteria into the vitreous more than any kind of injury in connection with a mild infection, and that an infection of a small quantity of very virulent germs shows a greater influence in this respect than one of a large quantity of a weaker culture.

From a general view of these four groups of experiments we can establish these important facts:

1. Bacteria injected into the blood often disappear within a very short time, varying according to the culture used.

2. Microbes which have disappeared from the blood can reappear after a varying lapse of time, and thereby gain entrance into the eye.

As it is known that certain of the internal organs seize upon microbes circulating in the blood, such a reappearance of the bacteria may be explained by supposing that there are times when the internal organs can no longer hold all the injected and multiplied germs, and that the surplus bacteria are then thrown again into the general circulation. Hence insufficient activity of the internal organs, or their weakness from any cause, favors a prolonged stay of the bacteria in the blood, or it may be several reappearances, and consequently it favors endogenous infection of the eye.

3. The presence in the eye of a culture injected into the blood can be demonstrated even when it has disappeared from the circulation.



## MICROSCOPICAL EXAMINATION OF THE HARDENED EYE-BALLS.

Thirteen eyes from which positive results had been obtained were cut into sections and examined. In two no microbes were found, in eleven the same bacteria were found which had produced the general infection. In the anterior portion of the eye they were mostly in different parts of the ciliary processes, especially in the neighborhood of the vessels, and sometimes in the vessels themselves. They were found only three times in the tissue of the iris, where they were enclosed in leucocytes. These had probably come from the anterior chamber. In the posterior portion the bacteria were found seven times in the tissue and vessels of the retina, five times in the tissue and vessels of the choroid, usually in both tunics at the same time. Only once were they found in the lymph space of the sheath of the optic nerve. In this case one could be assured of the direct passage of the bacteria from this space into the sclera and choroid, which apparently took place simultaneously with the endogenous infection of the eye from the blood stream, because the bacteria were present in various vessels of the eye. It is noteworthy that in all cases, except Experiments D and E, the walls of the vessels showed no changes in spite of the presence of bacteria within them and in spite of the passage of the bacteria into the neighboring tissues, and that no exudates or emboli could be seen within them.

A great part of the microbes found were enclosed in mono- and polynuclear leucocytes and in the endothelial cells. This extensive phagocytosis was no less marked in those cases in which during life almost no symptoms of irritation could be observed.

## CONCLUSIONS.

1. It is possible experimentally to induce the entrance into the vitreous of bacteria circulating in the blood.
2. This entrance of bacteria into the vitreous is not from the anterior chamber, but from the blood-vessels of the posterior portion of the eye.
3. Bacteria circulating in the blood enter the aqueous

from the ciliary vessels, the vitreous from the retinal and choroidal vessels. The iris and the lymphatic spaces of the optic nerve apparently play no part in this respect, although the simultaneous diffusion of the microbes by continuity through the lymph space of the sheath of the optic nerve to the eye is frequently possible.

4. In spite of the absence of inflammatory symptoms, phagocytosis, directed toward their destruction, is always present when bacteria have entered an eye.

5. Under certain favorable circumstances, a severe inflammation of the eye can be obtained endogenously by experiment.

6. With a mild or moderately severe general infection, bacteria enter the vitreous only when the eye has been injured shortly before; an injury to both the anterior and posterior portions of the eye forms the most favorable condition for the entrance of bacteria, an injury to the posterior portion of the eye alone the next most favorable, and in a far less degree an injury to the anterior portion.

7. With a severe general infection, bacteria circulating in the blood may frequently pass into the vitreous of normal, non-irritated eyes.

How is the favorable influence of irritation, or of the great virulence of bacteria circulating in the blood, upon the power of penetration of the latter into the eye to be explained?

The influence of the irritation may be explained by the irritation of the sensory nerves, by the hyperæmia excited, or perhaps by both of these combined. The experiments of Roger, Buffer and Charrin, Hermann, Caspar, Nekam, Babinski and Meunier, Hofbauer and Czylarz with division of the renal, pneumogastric, and auriculo-temporal nerves, as well as those of Trambusti and Comba with excision of the inferior cœliac ganglion, seem to show that the destruction or exclusion of the normal function of a nerve particularly favors the entrance into the corresponding organ of bacteria circulating in the blood. Hofbauer and Czylarz, who experimented with the ischiadic nerve and made a series of control experiments with extirpation of the abdominal sympathetic and partial section of the spinal cord, concluded

that section of the ischiadic nerve favored the settlement of bacteria in the corresponding extremity, not in consequence of the paralysis of the motor or sensory nerve fibres, but as the result of the exclusion of the sympathetic and the resultant hyperæmia. No similar experiment has been made in regard to the eye, but some facts seem to indicate that the irritation of the eye facilitates the entrance of bacteria from the blood, not only through the hyperæmia induced, but also through a trophic disturbance of the walls of the vessels and a reduction of the power of resistance of their endothelial cells, due to the immediate influence of the irritated sensory nerves. It is a well-established fact that the vessels of the eye show a great sensitiveness to a slight irritation of the surface of the eye, and it is to be added that the permeability of the ocular vessels is different from normal in the presence of irritation. These changes in the walls are probably of a trophic sort, because in all experiments with appearance of fibrin in the aqueous after irritation of the eye, as well as in all with entrance of bacteria into the injured eye, with the exception of two in which the bacteria caused inflammation of the entire eye, no change was visible with the microscope. Such trophic changes must be supposed to have taken place when bacteria enter a non-irritated eye, produced apparently by the action of the bacteria or of their toxins.

From our experiments, in conjunction with those of earlier writers, these two important facts can be deduced:

1. In experimental endogenous infection of the eye, the vitreous is a more favorable soil for the propagation of bacteria which have gained entrance than the aqueous, but the entrance of the bacteria is effected with more difficulty into the vitreous than into the aqueous.

2. Bacteria circulating in the blood can enter the aqueous and the vitreous in the absence of all inflammatory, embolic, or thrombotic processes in the vessels of the eye; to permit their passage, their trophic action on the vessel walls is sufficient.

It still remains undetermined why the bacteria find more difficulty in entering the vitreous than the aqueous, and also



whether it is possible to excite inflammation in an uninjured eye by the entrance of bacteria without organic changes in the vessel walls. These and other questions must be left for solution to future investigations, but some interesting points may be gleaned from what has been done. No inflammation accompanied the entrance of the bacteria into the aqueous alone, but inflammation was produced by their entrance into both aqueous and vitreous, therefore it may be asked whether the severity of endogenous eye diseases in men, which differs greatly in the same general disease, may not probably be determined not only by the virulence of the bacteria, but also by the location of the primary place of infection, in the anterior or posterior part of the eye. This conjecture receives support from the fact determined by pathological investigations that in the severer forms of endogenous eye disease the focus almost always lay in the choroid and retina, while the milder forms of disease, which rarely can furnish material for such examinations, may be ascribed with probability to a primary infection of the anterior part of the eye, especially the escape of microbes from the ciliary vessels into the aqueous, whence they invade the iris and other tissues.

In all our experiments, as in those of others, when the bacteria entered the aqueous only, and in all but two of ours in which they entered the vitreous, no clinical signs of inflammation were produced. This apparently paradoxical result may be explained by the insignificance of their number in most cases, their quick expulsion in the lymph stream from the aqueous, and the energetic phagocytosis in both aqueous and vitreous, and as we saw that various irritations favor the entrance of bacteria into the eye we can draw this conclusion :

All local and general processes in the organism which weaken the tissues and the cells, *e.g.*, previous sickness; all local lesions which interfere with the lymph circulation of the eye; all external and internal irritations of the eye, as accidental traumas, operations, strain of the accommodation from errors of refraction; all physiological and pathological conditions which cause hyperæmia of the eye, such as pregnancy, diseases of the heart, liver, kidneys, etc.; everything



which weakens or destroys the functions of the nerves of the eye, especially of the trigeminus and cervical sympathetic,—all of these conditions can give rise to endogenous infection of the eye in the presence of a local focus of infection in the organism.

A complete exposition of predisposing causes is not only of theoretical, but of practical interest in the way of prophylaxis. The facts now known show the need of a thorough examination of the general condition of a patient before any operation is performed, and the great importance of rest in the slightest infectious disease.

In closing we do not claim that we have added much that is new to the knowledge of endogenous infection of the eye, but our experiments confirm and complete some well-known clinical facts, explain a portion of them, and indicate the direction for future investigation.

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## THE VALUE OF OPHTHALMIC EXAMINATIONS IN THE DIFFERENTIAL DIAGNOSIS BE- TWEEN TYPHOID FEVER AND ACUTE MILI- ARY TUBERCULOSIS.<sup>1</sup>

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(With two text-cuts.)

MY attention was called to this case about November 3, 1902, by one of the junior assistants of the St. Louis City Hospital, who asked me to examine the patient's eyes for the presence of choroidal tubercles, hoping thus to be able to diagnosticate between typhoid fever and acute miliary tuberculosis. The history was as follows:

C. McH., æt. thirty-five, admitted October 24, 1902.

*Habits.*—Smokes in moderation. No drug habits. Chews a great deal. Drinks whiskey and beer in moderation. Regular in eating and sleeping hours. Excesses in venery.

*Family history.*—Father has not been seen by patient for twenty years. Mother died of dysentery. Three brothers and two half-brothers healthy. No history of cancer or nervous affection.

*Personal history.*—Never married. Is tobacco wrapper; light work, but indoors.

*Previous diseases.*—Chicken-pox, typhoid-pneumonia, malaria, gonorrhœa fourteen years ago. No history of lues. No injuries of any kind.

*Present trouble.*—Became sick about four weeks before coming to the hospital, but worked a part of the time. Rigors and chilly

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<sup>1</sup> Read before the Medical Society of the St. Louis City Hospital Alumni.

sensations, general malaise; no headache, nosebleeding, or vomiting. Limbs and back ached. Anorexia. Face looks heavy, lips and tongue dry. Weighs about 110 lbs., but formerly weighed 135 lbs. Height, 5 ft. 6 in. Is not well nourished. Lips anæmic.

*Digestive apparatus.*—Tongue coated, but clean around the edges. Abdomen somewhat distended and tender on pressure. Ileo-cæcal gurgling. Inclined to constipation. Spleen and liver enlarged.

*Respiratory apparatus.*—Coughs and spits occasionally. No râles; breathing a little harsh, but otherwise normal. Respiration quickened.

*Circulatory apparatus.*—Pulse rapid, heart sounds normal. Sweats in early morning. No rose spots. Widal negative. No leucocytosis. Pulse full, but of low tension. No tache cérébrale.

*Urinary system.*—Diazo negative; urine 1.005, pale yellow, acid, clear, no albumin, no sugar.

*Nervous system.*—Sleeps well, no subsultus, no carphologia, no tache bleuâtre, no pain.

*Diagnosis.*—Typhoid fever.

*Prognosis.*—Guarded.

*Treatment.*—Stimulants, baths.

The blood was examined four times for the Widal reaction, which was always negative. The urine was three times negative for the diazo. Plasmodia malariae were not found. The sputum and the blood were examined for tubercle bacilli, but none was found. Towards the last, the lungs showed symptoms of involvement, viz., more frequent cough, pain in the lower part of the chest, a few dry râles, but no area of dulness. Patient grew gradually weaker, became somewhat delirious, and died November 21st.

The diagnosis lay, as it usually does, between typhoid fever and acute miliary tuberculosis, with the weight of opinion in favor of the former. The Widal and diazo reactions were negative, the course of the temperature atypical, and the rose spots were not seen. On the other hand, there was no history of tuberculosis, the lungs gave no evidence of involvement until the last few days, and then only such as might be caused by the typhoidal process. Tubercle bacilli were at no time found in the sputum, blood, or fæces.

It is unfortunate that just at this juncture, when the eye symp-

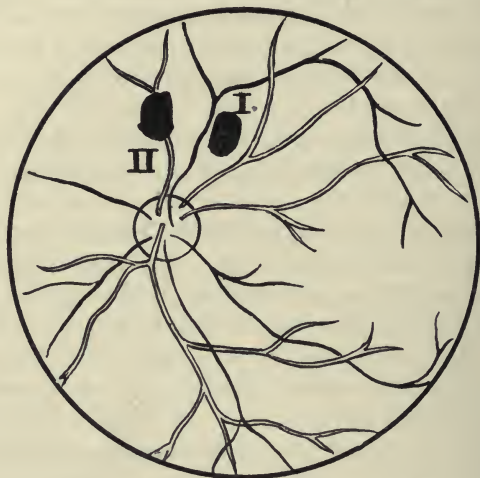
toms would have proved a valuable aid in the diagnosis, the oculists who saw the case disagreed as to the condition present in the eyes. The physicians in charge can not be blamed for adhering to their diagnosis of typhoid fever, when of the five oculists who saw the case, three said that the fundi were absolutely normal, one diagnosticated "infiltrations of the choroid" without a positive statement as to their nature, while only one made and maintained the diagnosis of miliary tuberculosis of the choroid.

The examination of the eyes revealed the following conditions: Pupils dilated, reacting somewhat sluggishly to light. Patient made no complaint of disturbance of vision, which is of common occurrence in at least the earlier stages of choroidal affections. No test cards were at hand to make tests for visual acuteness, but patient, up to the evening before his death, certainly possessed a considerable amount of vision. Patient was so weak that it was necessary to examine him in a recumbent position. The source of light was an ordinary incandescent lamp, and the room could not be darkened sufficiently. These factors rendered the examination very difficult and no doubt determined the difference in the ophthalmic pictures as seen by the consulting oculists. In the right eye, I was unable to make out any pathologic changes. The left, however, showed in the lower and middle portion of the inverted image, consequently in the upper and middle portion of the fundus, a small yellowish-white patch, lying immediately adjacent to one of the superior vessels. The limitations of the patch were fairly sharply defined from the surrounding fundus by its color, but there was no pigment ring. I was unable to determine whether the patch lay in the same plane as the choroid or projected forwards.

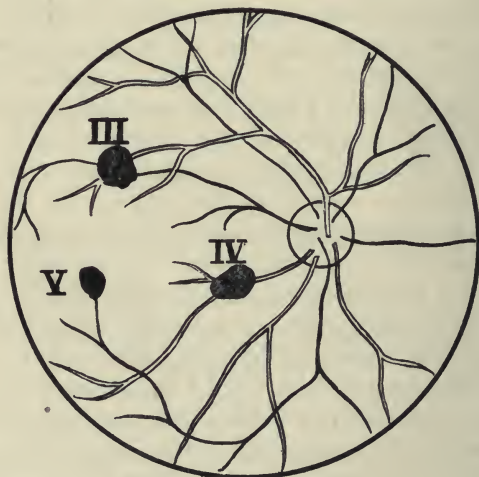
I again examined the patient on November 7th. This time in the left eye there were two patches, in the same region, separated from each other by about 2mm, and plainly projecting above the niveau of the fundus. I have numbered these patches I and II respectively on the drawings. Number II lay so close to Number I that I should have seen it if it had been present at the first examination. I conclude that it had developed in the interval between the two examinations; probably a submiliary tubercle had grown enough to become ophthalmoscopically visible. A thorough examination of the fundus, so far as it was possible without the use of a mydriatic, revealed nothing further. In the right eye, however, there was now to be seen a focus corresponding to the



others in all particulars except in point of size and position. It was smaller than they, and lay more towards the macula. It is represented on the drawings by Number III. A fortunate circumstance was its position beneath one of the temporal retinal vessels, which could plainly be seen running over and raised by it.



L. E. ERECT IMAGE.



R. E. ERECT IMAGE.

My next examination was two days later. Some one, in the meantime, had dilated the pupil of the right eye with atropine.

The left eye showed an increase in the size of the tubercles but not in the number. In the right eye, however, were two new ones, numbered IV and V respectively. Both lay below the macula in the direct picture, consequently above in the indirect, V lying more peripherally than IV. Their positions correspond fairly well to the course of one of the inferior temporal vessels.

Repeated examinations, continued up to the day before his death, showed no change in the number of the tubercles, but a gradual increase in their size was noticed. Towards the last, the patient became more difficult to examine, owing to the super-vention of a semi-comatose condition. Patient died Nov. 21st, three weeks after he came under my observation.

The **post-mortem** revealed a general miliary tuberculosis. Only the posterior segments of the eyes were removed. In the right eye were three yellowish-white nodules, lying subretinally and evidently arising from the choroid. Their positions were the same as I had made out ophthalmoscopically. Only three were macroscopically visible. The left eye contained only two tubercles, each about the size of the optic disc, and lying in the positions I had determined *intra vitam*. I had hoped to be able to demonstrate one fundus macroscopically and one microscopically, but the right eye was secured by some one else, and I was compelled to limit my investigations to the left. I am therefore able to demonstrate only one of the tubercles in the left eye; the other has been removed for microscopical examination. It will be seen that the remaining one corresponds to the description which I have already given.

The microscopical examination of the tubercle removed showed it to be a fusiform enlargement with the long diameter from above downwards, lying wholly within the choroid. The retina was detached from the choroid and the latter from the sclera during the process of removal and hardening. The pigment layer of the retina still adheres to the choroid except over the tubercle itself, where it fails entirely. Portions of the choroid are adherent to the sclera. This is especially true of the area beneath the tubercle, where there has been a migration of the choroidal pigment into the sclera, accompanied by a slight degree of small-cell infiltration. A scleral blood-vessel is seen in cross-section, and the surrounding tissue shows a small-cell infiltration. Otherwise the sclera is normal.

The choroid is in places infiltrated with round cells, the blood-

vessels are full, and the pigment cells seem increased in number and massed together. As they approach the tubercle, the infiltration and the distension of the blood-vessels become more prominent, and the pigment cells become divided into two layers. One of these passes posteriorly to the tubercle, the other anteriorly. Where the section passes through the centre of the tubercle, the posterior layer is interrupted for a short distance, just at the posterior pole of the tubercle, to reappear a little farther on. In the other sections, it is seen as one continuous layer. Anteriorly, the layer consists of a few scattered cells which can be followed only for a short distance either above or below.

The microscopical picture suggests the impression that the tubercle started in the middle layers of the choroid and growing in all directions, pressed aside the pigment cells into two layers. Owing to the more rapid growth of the central portion, especially anteriorly, a pressure atrophy of the pigment cells ensued. Remains of these may be seen in the form of small deposits of pigment scattered here and there through the tubercle.

As to the tubercle itself, the picture varies with the location of the section. Where this passes through the middle of the tubercle in its long diameter, the centre is seen to be occupied by a blood-vessel with thick walls, cut in the longitudinal direction. In this are numerous leucocytes, while around it is an incomplete sheath consisting of a few cells with large nuclei, a large number of leucocytes, and a matrix of poorly staining, homogeneous substance, in which lies the detritus of broken-down cells, nuclei, and pigment granules. Here and there, fibres of interstitial tissue can be recognized by their staining with acid fuchsin. No giant cells are to be found, which is all the more to be deplored, as this is one of the few places in the body where giant cells containing pigment granules have been seen. Peripherally, especially above and below, the so-called epithelioid cells appear in large numbers. Here they lie in wedge-shaped areas, whose apices are directed towards, and lie in the angle formed by, the diverging layers of pigment cells mentioned above. They resemble an advance guard preparing the way for other pathologic conditions.

As the sections approach the periphery of the tubercle, the picture changes somewhat. The blood-vessel disappears or appears only in cross-section. The caseous degeneration persists to the periphery of the tubercle, in lessening amount. The interstitial tissue increases and arranges itself so as to form small



subdivisions of the tubercle, each with its central area of caseous degeneration, and its more peripherally lying round and epithelioid cells. As to the other characteristic feature of a miliary tubercle, viz., the giant cell, I cannot say that I saw a distinctly typical one in any of the sections examined, and I should prefer to say they were absent, rather than assign to accidental forms a value they do not possess.

If the diagnosis were in doubt, however, it would be fully settled by the *bacteriologic findings*. I have been able to demonstrate clearly the presence of the tubercle bacilli in the tumor mass. The method of staining was very simple. I placed the sections for twenty-four hours in the Ziehl-Nielsen carbol-fuchsin solution, washed out the excess of the stain, let them lie for twenty-four hours in distilled water to dissolve out all possible excess of the stain, decolorized carefully in a moderately strong solution of nitric acid, and finally counterstained with a saturated aqueous solution of methylene blue. The bacilli lie especially in those portions of the tubercle which are undergoing caseous degeneration.

Tubercles of the choroid have been known for nearly one hundred years. Autenrieth, in 1808, reported the finding of choroidal tubercles in the eyes of a cadaver. He described them as "isolated, white pustules of size of an ordinary pin's head, which are similar to those found *post mortem* on the peritoneum of patients dying of consumption. Jaeger, in 1855, reported that he had seen choroidal tubercles *intra vitam*, by means of the ophthalmoscope, but his report attracted little attention. The credit of presenting the subject anew, and of calling the attention of the scientific medical world to the value of tubercles of the choroid in diagnosing between miliary tuberculosis and typhoid fever, belongs to MANZ. Since the publication of his papers, the literature relating to tuberculosis of the choroid has become very voluminous. I subjoin a list of the articles on the subject. Where I could obtain the original article, I made a brief abstract of it. The number of American papers on this subject is very small, less than half a dozen.

The classical tubercles of the choroid lie in the region surrounding the optic disc and the macula lutea. They are



roundish and varying in size, ranging from 0.3mm to 2.5mm in diameter. To be ophthalmoscopically visible, they must possess a diameter of more than 0.6mm. They arise from the tissue of the choroid. Within this they reach a certain size, then grow outwards towards the retina, pushing apart the cells of the pigment epithelium. This causes a focus of whitish discoloration on the fundus, directly proportionate to the size of the tubercle. (Becker reported a case where the tubercle, although of 1mm diameter, was completely covered by the pigment layer of the retina, and was invisible until this was removed.) There is a gradual transition from the whitish centre of the tubercle to the normal red of the fundus, and a pigment ring is very rarely seen. That the tubercle really projects above the niveau of the fundus is demonstrable by means of the parallax movements, especially if it lies immediately under or in close proximity to a retinal vessel. There are usually no changes in the refractive media, and no hemorrhages. The tubercles may appear at any stage of the disease, and sometimes grow so rapidly as to become ophthalmoscopically visible overnight.

In regard to the etiology of the process, tuberculosis of the choroid can arise from two different causes: ectogenous, when the infection is conveyed into the eye from without, *e. g.*, by a trauma; or endogenous, when the bacteria are carried to the eye from some other part of the body. The ocular tuberculosis may be a part of a general miliary tuberculosis, or it may be the only focus demonstrable in the body. It may caseate and break into a blood- or lymph-vessel, and so be the origin of a general miliary tuberculosis.

Opinions differ as to the frequency with which tuberculosis of the choroid is a part of a general miliary tuberculosis. Cohnheim found it in almost every case. I was unable to obtain the exact percentage. On the other hand, Dahl found it absent in all of three cases. Between these two extremes are the findings of the following authors: Bouchert, 10%; Bock 82.7%; Demme, 21%; Litten, 75%; Carpenter and Stephenson, 50%, also in 9.25% of tuberculous affections other than general miliary tuberculosis. From such wide diversity of findings, no fixed conclusions as to

the frequency of the occurrence can be drawn, but at least we may expect to find tuberculosis of the choroid in at least 50% of the cases of general miliary tuberculosis. Its absence does not disprove the presence of the general process. Its presence, especially when its development can be followed, coupled with other less characteristic symptoms, is pathognomonic of a general miliary tuberculosis. In cases of supposed typhoid fever running an atypical course, especially where the Widal is negative, the eye should be examined. The presence of tubercles may not affect the therapeusis of the case, but there are certainly cases in which a correct diagnosis is imperative from a forensic standpoint as well as being scientifically satisfactory. Apropos to the discussion, there are usually submiliary tubercles present in addition to those ophthalmoscopically visible. These may at any time grow so rapidly that they may be seen *intra vitam*. A second or even a third examination may demonstrate their presence.

In conclusion, I wish to thank the members of the hospital corps for the courtesy through which I was enabled to make a study of the case, and also Dr. Barck, who placed his library at my disposal and made the collection of the following literature possible.

NAME.	PUBLICATION.	DIAGNOSIS.	MACROSCOPIC APPEARANCES.	MICROSCOPIC APPEARANCES.
Alexander.....	<i>Centralbl. f. prakt. Augenheilk.</i> , 1884.			
Auger .....	<i>Gaz. méd. de Paris</i> , 1878, 622.			
Autenrieth....	<i>Versuch. f. d. prakt. Heilk. aus d. klinische Anstalten von Tübingen</i> , 1808.		White pustules of size of pin's head in choroid.	
Ammon.....	<i>Holcker's lit. Annalen</i> , Bd. xv.			
Bach .....	<i>Arch. f. Augenh.</i> , Bd. xxviii., 536, 1893. (English Edition.)	Tub. of eye.	Tuber. of iris, ciliary body, choroid, retina, sclera.	Epithelial cells, giant cells, leucocytes.
"	<i>Münch. med. Wochenschr.</i> , 1895, No. 18.			
Bauhut .....	<i>Comptes rendues du congrès méd. de Paris</i> , 1867, 455.			
Bargartz .....	<i>Nagel's Jahresb.</i> , 1891, 162.			
Barlow .....	<i>Lancet</i> , Nov., 1883, 925.			
Baumgarten...	<i>Arch. f. Ophth.</i> , xxiv., 3, 185.			
Becker, v.....	<i>Notisblad för Läkare och farmaceuten</i> , 1868, Helsingfors.			
Berardinis....	<i>Nagel's Jahresb.</i> , 1898, 324.			
Bongartz .....	<i>Ueber d. Ausbreitung d. tuberculösen Infection im Auge</i> . Würzburg, 1891.			
Bock .....	<i>Virchow's Archiv</i> , Bd. xci.			
Bouchert .....	<i>Nagel's Jahresb.</i> , 1884, 352.			
"	<i>Atlas d'opht. médic.</i> , p. 63.			
"	<i>Gaz. des hôpitaux</i> , 1868, Dec. 31.	Tuberculosis of choroid.	Miliary tuber. of choroid, neuritis.	
"	<i>Gaz. des hôpitaux</i> , 1869, No. 1.	Tuberculosis of choroid.	Miliary tuber. of choroid, neuritis.	
"	<i>Gaz. des hôpitaux</i> , 1870, pp. 245-250.			
"	<i>Gaz. des hôpitaux</i> , 1871, Nos. 25, 26.	Tuberculosis of choroid.	Miliary tuber. of choroid, neuritis.	
"	<i>Gaz. des hôpitaux</i> , 1875, 338.	Tuberculosis of choroid.	Miliary tuber. of choroid, neuritis.	
"	<i>Union méd.</i> , Oct. 16, 1869.	Tuberculosis of choroid.	Miliary tuber. of choroid, neuritis.	
Brailey.....	<i>Trans. Ophth. Society United Kingdom</i> , 1884, vol. iii., 129.			
Barraquer.....	<i>Rec. d'opht.</i> , Aug., 1882, 475.			

NAME.	PUBLICATION.	DIAGNOSIS.	MACROSCOPIC APPEARANCES.	MICROSCOPIC APPEARANCES.
Brückner . . . .	<i>Arch. f. Ophth.</i> , xxxvi., 3, 154.	Tuber. of choroid. Optic neuritis.	Miliary tuberculosis of choroid, neuritis.	Round cells, giant cells, epithelioid cells, caseous degeneration.
Burnett, S. M.	<i>Archives of Ophthalmology.</i>	Intraocular tumor.	Tumor of choroid, extending from optic nerve to ora serrata.	Round cells, giant cells, caseous degeneration.
Busch . . . . .	<i>Virchow's Archiv</i> , Bd. xxxvi.			
Carpenter . . . .	<i>Brit. Med. Jour.</i> , 1891, 66.			
"	<i>Lancet</i> , 1901, ii., 134.			
Castenholz . . .	<i>Nagel's Jahresb.</i> , 1884, 254.			
Charpentier . . .	<i>Nagel's Jahresb.</i> , 1895, 361.			
Chevallereau . .	<i>Nagel's Jahresb.</i> , 1897, 472.			
Cohnheim . . . .	<i>Virchow's Arch.</i> , Bd. xxxix.			
Corrozi . . . . .	<i>Galezowsky, archiv. génér. de méd.</i> , 1867.			
Coupland . . . .	<i>Trans. of Path. Society of London</i> , 1874, 215.			
Davidsohn . . . .	<i>Nagel's Jahresb.</i> , 1888, 370.			
Demme . . . . .	<i>Twenty-fifth Med. Report on the Fenner's Children's Hospital at Berne</i> , 1888.			
Denig . . . . .	<i>Arch. f. Augenh.</i> , xxxi., 359.			
Denti . . . . .	<i>Nagel's Jahresb.</i> , 1894, 383.			
Deutschmann . .	<i>Nagel's Jahresb.</i> , 1891, 162.			
"	<i>Arch. f. Ophth.</i> , xxvi., 2, 99.	Miliary tuberculosis of choroid, experimentally produced.	Tuberculosis of choroid, vitreous, and retina.	Round, epithelioid, and giant cells.
"	<i>Arch. f. Ophth.</i> , xxvii., 1, 224.	Mil. tuber. of choroid following tuber. meningitis experimentally produced.	Mil. tuber. of sheath of optic nerve, vitreous, and choroid.	Round and epithelioid cells, no typical giant cells.
Daulonoy . . . .	<i>Nagel's Jahresb.</i> , 1900, 566.			
Dinkler . . . . .	<i>Arch. f. Ophth.</i> , xxxv., 4, 313.	Ileo-typhus, miliary tuberculosis.	Unpigmented, spindle-shaped swelling, especially in temporal part, nerve and retina not involved.	Changes in pigment epithelium. Free pigment. Submiliary and miliary tubercles. Diffuse infiltrations. Pigmented giant cells.



NAME.	PUBLICATION.	DIAGNOSIS.	MACROSCOPIC APPEARANCES.	MICROSCOPIC APPEARANCES.
Dubrisoy.....	<i>Gaz. des hôpitaux</i> , 1875, 850.			
Duci .....	<i>Nagel's Jahreshb.</i> , 1888, 371.			
Edrington.....	<i>Lancet</i> , Feb., 1899.	Choroiditis purulentia tuberculosa?	Detachment of retina, due to large mass between retina and choroid.	Round-cell exudation in mass, typical tuberc. structure.
Eperon .....	<i>Arch. d'opht.</i> , iii., 485, 1884.			
Falchi.....	<i>Annal. di Ottalm.</i> , xi., 132.			
Fränkel, B....	<i>Berlin. klin. Wochen.</i> , 1872, 4-6.	Tuber. of choroid.	L. E., one large spot. R. E., small spots.	
"	<i>Jahresbuch f. Kinderheilk.</i> , Neue Folge, ii. Bd., 113.			
Fromaget.....	<i>La clinique opht.</i> , 1902.			
Garlick .....	<i>Medico-chirurg. Trans.</i> , vol. lxii, 441, 1879.			
Gerlach.....	<i>Anat. Bericht über d. Versamml. d. Gesellsch. deutsch. Naturforscher und Aertze in Wiesbaden</i> , Sept., 1852.	Miliary tuberculosis of choroid.		
Graefe, A. v. . .	<i>Arch. f. Ophth.</i> , ii., 120.	Accidental finding in pig's eyes.	Prominence in sclera filled with white tumor; numerous small nodules.	Caseous degen. of tumor, nodules in structure similar to tuber. of lungs.
"	<i>Arch. f. Ophth.</i> , xiv., 1, 183.			
Gruening .....	<i>N. Y. Eye and Ear Infirmary Reports</i> , Jan., 1901.	Tuberculosis of choroid; both eyes.	Numerous miliary and submiliary tubercles.	
Grosz.....	<i>Nagel's Jahreshb.</i> , 1900, 566.			
Gutman.....	<i>Arch. f. Augenheilk.</i> , xxxi., 158.			
Haab .....	<i>Nagel's Jahreshb.</i> , 1891, 145.			
"	<i>Klin. Monatsbl. f. Augenheilk.</i> , xxii., 391, 1884.	Intraocular tumor.	Large tumor, central caseation.	Round cells, giant cells, tubercle bacilli.
"	<i>Arch. f. Ophth.</i> , xxv., 4, 221.			
Haight.....		General discussion of subject.		
Hartley .....	<i>Ophth. Review</i> , 1887, 86.	Tuberculosis of the Eye.		
Heinzel .....	<i>Jahreshb. f. Kinderheilk.</i> , Neue Folge, viii., 3, 331.			
Hirschberg ...	<i>Centralbl. f. prakt. Augenheilk.</i> , 2, 1877.			



NAME.	PUBLICATION.	DIAGNOSIS.	MACROSCOPIC APPEARANCES.	MICROSCOPIC APPEARANCES.
Liebrecht .....	<i>Munch. med. Wochenschr.</i> , 1897, 22.			
Lionville .....	<i>Bull. de la soc. anat. de Paris</i> , 1873, 19, 300.			
Litten .....	<i>Nagel's Jahreshb.</i> , 1878.			
McHardy .....	<i>Trans. Ophth. Society United Kingdom</i> , 1888, viii., 179.			
Manfredi .....	<i>Annal. di Ottal.</i> , iv., 265, 291.	Intraocular abscess.	Miliary tubercles in stage of degen. in choroid, retina, optic nerve.	Caseous degeneration, giant cells.
"	<i>Annal. di Ottal.</i> , iii., 439.			
"	<i>Archiv. d'opht.</i> , i., 44.			
Mackenzie ....	<i>Trans. Ophth. Soc. United Kingdom</i> , 1884, iii., 119.			
"	<i>Medical Times and Gazette</i> , ii., 512.			
Manz.....	<i>Zehender's klin. Monatsbl. f. Augenh.</i> , xix., 26.			
"	<i>Arch. f. Ophth.</i> , iv., 2, 120.	Miliary tuberculosis, typhoid fever.	Three tubercles L. E. One tubercle R. E.	Caseous degen., mono- and multinuclear cells, cells of different sizes and shapes.
"	<i>Arch. f. Ophth.</i> , ix., 3, 133.	None, intra vitam.	Several tubercles.	Cells of different sizes and shapes, detritus in centre, submiliary tubercles.
"	<i>Nagel's Jahreshb.</i> , i.			
Maren.....	<i>Nagel's Jahreshb.</i> , 1884, 325.			
Marguliesco...	<i>Nagel's Jahreshb.</i> , 1898, 741.			
Mendel.....	<i>Berlin. Ophth. Gesell.</i> , May, 1901.			
Michel.....	<i>Klin. Monatsbl. f. Augenh.</i> , 1873, 263.			
"	<i>Deutscher Archiv f. klin. Medicin</i> , Bd. xxii., 439, 1878.			
Millingen.....	<i>Gaz. med. d'orient</i> , xxxiii., 11.			
Money.....	<i>Lancet</i> , ii., 813, 1883.			
Morton.....	<i>Brit. Med. Journal</i> , 1891, 169.			
"	<i>Brit. Med. Journal</i> , 1892, i., 1190.			
Muhlert.....	<i>Nagel's Jahreshb.</i> , 1885, 186.			
Mules.....	<i>Ophth. Review</i> , 1885, iv., 1.			
"	<i>Report Ophth. Soc. Great Britain</i> , 189.			

NAME.	PUBLICATION.	DIAGNOSIS.	MACROSCOPIC APPEARANCES.	MICROSCOPIC APPEARANCES.
Mules .....	<i>Brit. Med. Journal</i> , 1884, ii., 1043.			
"	<i>Nagel's Jahreshb.</i> , 1884, 325.			
Neese .....	<i>Arch. f. Augenh.</i> , xvi.			
"	<i>Arch. f. Augenh.</i> , xxxii.			
Neskowic .....	<i>Nagel's Jahreshb.</i> , 1883, 306.			
Nettleship ....	<i>Nagel's Jahreshb.</i> , ii., 221.			
"	<i>Ophth. Hospital Re- ports</i> , vii., 221.			
Ostenholz .....	<i>Inaug. Dissertation</i> , München, 1884.			
Pagenstecher, H. ....	<i>Atlas der path. Anat- omie</i> .			
Pasquier .....	<i>Journal d'opht.</i> , i., 560.			
Poncet .....	<i>Recueil d'opht.</i> , 1875, 189.			
Ponfik .....	<i>Nagel's Jahreshb.</i> , iii., 317.		Choroidal tu- bercle 5 mm. in diameter.	
Pröbsting .....	<i>Klin. Monatsbl. f.</i> <i>Augenh.</i> , 1891, 321.			
"	<i>Berlin. klin. Wochen- schr.</i> , 1884, 37.			
Raab .....	<i>Arch. f. Ophth.</i> , xxiv., 3, 164.			
Rambolotti .....	<i>Nagel's Jahreshb.</i> , 1894, 383.			
Reissmann .....	<i>Arch. f. Ophth.</i> , xxx., 3, 251.	Choroiditis, pur. tuberculosa?	Perforation of ball, multiple miliary tubercles.	Round, epithe- lioid, and giant cells; caseous de- generation.
Remy .....	<i>Nagel's Jahreshb.</i> , 1883, 423.			
Roberts .....	<i>Nagel's Jahreshb.</i> , 1893, 322.			
Salamon .....	<i>Tagebl. der 49. Na- turforscher Versamml.</i> , 8, 1876.			
Saltino .....	<i>Archiv. di Ottal.</i> , i., 383, 1894.			
Sattler .....	<i>Klin. Monatsbl.</i> , 1877, 68, 71.			
"	<i>X. Versamml. d.</i> <i>Ophth. Gesell. in Heidel- berg</i> .	Irido - choroido- retinitis tubercu- losa.		
"	<i>Arch. f. Ophth.</i> , xxiv., 3, 151.	Orbital tumor.	Choked disc, tu- bercles of retina in circumpapil- lary area.	Hypertrophy of supporting fibres of retina. Ep- ithelioid, giant, and round cells, No degen. Tu- berculosis of optic nerve.



NAME.	PUBLICATION.	DIAGNOSIS.	MACROSCOPIC APPEARANCES.	MICROSCOPIC APPEARANCES.
Schaefer .....	<i>Klin. Monatsbl. f. Augenh.</i> , xxii., 1884, 30.	Intraocular abscess and granulations.	Large tumor mass arising from choroid.	Pigment epithelium covering intraocular portion of tumor. Giant, epithelioid, and round cells.
Schmidt .....	<i>Klin. Monatsbl. f. Augenh.</i> , 1873, 43.			
Schöbl .....	<i>Central. f. Augenh.</i> , xii., 231, 1888.			
Schroeder. ....	<i>Arch. f. Ophth.</i> , xxxv., 3, 97.	Intraocular syphilitic tumor. Tuberculosis of choroid.	Intraocular tumor. Detachment of retina.	Round, epithelioid, and giant cells, detritus. Residuum of cysticercus.
Seccato .....	<i>Giornali d. R. Acad. di Med. Torino</i> , 1888, vol. 1.			
Sgrosso .....	<i>Annal. di Ottal.</i> , 1901.			
Shears .....	<i>Nagel's Jahresb.</i> , 1888, 372.			
Sieffert .....	<i>Four. d'opht.</i> , i., 526, 560.			
"	<i>Nagel's Jahresb.</i> , 1872, 362.	Neuritis optica.	Neuritis optica. Tuberculosis of choroid.	
Snellen .....	<i>Med. Tydschrift voor Genesk.</i> , 11, 1892.			
Soelberg-Wells	<i>Annal. d'oculist.</i> , 1867.			
Steffan .....	<i>Nagel's Jahresb.</i> , 1874, 27.			
Steffens .....	<i>Jahresb. f. Kinderh.</i> , ii., 315.			
"	<i>Jahresb. f. Kinderh.</i> , iii., 323.			
Stephenson ...	<i>Brit. Med. Journal</i> , Aug., 1901.			
"	<i>Lancet</i> , 1901, ii., 134.			
Stricker .....	<i>Charite-Annalen</i> , 1876, 329.			
Stoiesco .....	<i>Bull. de la soc. anat.</i> , 1874, 747.			
Tailor .....	<i>Annal. di Ottal.</i> , xviii., 1, 76.			
"	<i>Annal. di Ottal.</i> , xx., 309.			
Toupert .....	<i>Gaz. méd. de Paris</i> , 1884, 25.			
Troche .....	<i>Nagel's Jahresb.</i> , 1875, 263.			
Tuyl .....	<i>Klin. Monatsbl. f. Augenh.</i> , Nov., 1900.			
Ulrich .....	<i>Centralbl. f. prakt. Augenh.</i>			
Valude .....	<i>Bericht des Ophth. Gesell. in Heidelberg</i> , 1891, 66.			

*Typhoid Fever and Miliary Tuberculosis Differentiated.* 469

NAME.	PUBLICATION.	DIAGNOSIS.	MACROSCOPIC APPEARANCES.	MICROSCOPIC APPEARANCES.
Valude . . . . .	<i>Arch. d'opht.</i> , xi., 3, 1891.			
Vernon . . . . .	<i>Berlin klin. Wochenschr.</i> , 1868.			
Wagenmann . . .	<i>Arch. f. Ophth.</i> , xxxiv., 4, 158.	Cataract, sarcoma of choroid.	Detachment of retina. Tumor arising from choroid.	Round-cell infiltration of choroid, caseous degeneration. Typical miliary tubercles. Tubercle bacilli.
"	<i>Arch. f. Ophth.</i> , xxxiv., 4, 172.	Choroiditis exudativa.	Thickening of choroid, detachment of retina.	Round-cell infiltration of choroid, caseous degeneration. Typical miliary tubercles. Tubercle bacilli. Also hypertrophy of connective tissue in choroid.
"	<i>Bericht d. Ophth. Gesell. in Heidelberg</i> , 1891, 60.			
Warner . . . . .	<i>Trans. Ophth. Society, United Kingdom</i> , 1884, iii., 129.			
"	<i>Med. Times and Gazette</i> , ii., 512.			
Weiss . . . . .	<i>Arch. f. Ophth.</i> , xxxiii., 4, 57.	Conglomerate tubercle.	Large tubercle, composed of and surrounded by many miliary ones.	Giant, round, and epithelioid cells, caseous degeneration.
"	<i>Arch. f. Ophth.</i> , xxxiii., 4, 57.	Tubercle of choroid.	Five tubercles in macular region.	Giant, round, and epithelioid cells, caseous degeneration.
"	<i>Arch. f. Ophth.</i> , xxxiii., 4, 57.	Granuloma of iris.	Papillary tumor.	Giant, round, and epithelioid cells, caseous degeneration; also nests of cells binding together choroid and retina.
"	<i>Bericht d. Ophth. Gesell. in Heidelberg</i> , 1877, 121.			
Weissenfels . . .	<i>Nagel's Jahresb.</i> , 1882, 300.			

## BUPHTHALMOS IN A SUBJECT OF CONGENITAL DISLOCATION OF THE CRYSTALLINE LENS.

BY DR. F. W. MARLOW, SYRACUSE, N. Y.

F. B., aged twenty-two years, was seen first on July 4, 1900. He gave a history of defective vision, enlargement of the right eye from birth, and near-sightedness of the left eye. Inspection showed enormous enlargement of the right eye, haziness of the cornea, thinning and bulging of the sclera above, making a dark projection immediately above and practically continuous with the cornea, of which it seems to be an extension upwards. Although the eye has been enlarged from birth, the scleral staphyloma has probably come on during the last four years. V equals P. L. + T(?). Patient can close the lids over the eye. Examination of the left eye showed a partial dislocation of the lens:  $V = \frac{6}{60} -$ ; with + 6 D, + 1.5 c.,  $80^\circ = \frac{6}{24} +$ . On Oct. 8, 1900, the eye was enucleated under ether at the Hospital of the Good Shepherd and put into formalin for detailed examination at a later date with special reference to the relation of the lens to the other structures. Unfortunately, in the confusion incident to the rebuilding and reorganizing of the hospital, the specimen was mislaid and has not been recovered. It can scarcely be doubted, however, that in this case we have an example of buphthalmos, or infantile glaucoma, of which the main etiological factor was a congenital dislocation of the lens.

This patient's family history is of much interest, and I will record it in as correct detail as I was able to obtain it at the time. Five other members of this family, the subjects of congenital dislocation of the lens, have come under my personal observation:

No. 1. Mrs. G. W., aged twenty-one, seen in September, 1895. V always defective; has to have the room dark and hold a paper near in order to see to read. Was examined by a local oculist some years ago, who said that it was impossible to fit her with

glasses. Has daily occipital headache; bright light nauseates her. R eye: V with + 14 D =  $\frac{6}{18}$  -; iris tremulous; lens dislocated directly upward; fundus normal. L eye: V with + 14 D, + 1 D c.,  $140^\circ = \frac{6}{18}$ ; iris tremulous; lens dislocated inward and upward.

No. 2. Father of No. 1, æt. between fifty-five and sixty. I was called to see him at his house during the year 1896 on account of an impairment of sight. I found both lenses opaque and freely floating in an apparently fluid vitreous, one eye being in a state of acute glaucoma. Paracentesis and eserine relieved the acute symptoms. This patient gave a history of imperfect vision from childhood.

No. 3. F. B., female, æt. twenty-four, seen on June 27, 1901, cousin of No. 1. R iris normal, lens apparently normal; L iris tremulous at lower part, lens displaced up and in. After the pupils were dilated with scopolamine, the right iris was distinctly tremulous at the lower part of the pupil, which has a dark curved rim at the lower part, which is absent at the upper; fundus normal. R V =  $\frac{6}{8}$  -; with - 1 D c.,  $100^\circ = \frac{6}{8}$  -. Left eye: V =  $\frac{6}{24}$ ; with - 0.75 D, - 1.50 D c.,  $100^\circ = \frac{6}{18}$ .

No. 4. The case of buphthalmos already described.

No. 5. B. B., male, æt. twenty-seven, seen in October, 1900. Vision always defective; has never worn glasses; iris tremulous below, bulged forward in the upward and inward quadrant. The lenses are dislocated upward and inward, leaving  $\frac{1}{3}$  of the pupil unoccupied. R V with + 10 D =  $\frac{6}{24}$ . L V: with + 11 D =  $\frac{6}{24}$ .

No. 6. The son of No. 1, seen by the courtesy of Dr. G. G. Lewis, who brought him to my office as a specimen of congenital dislocation of the lens.

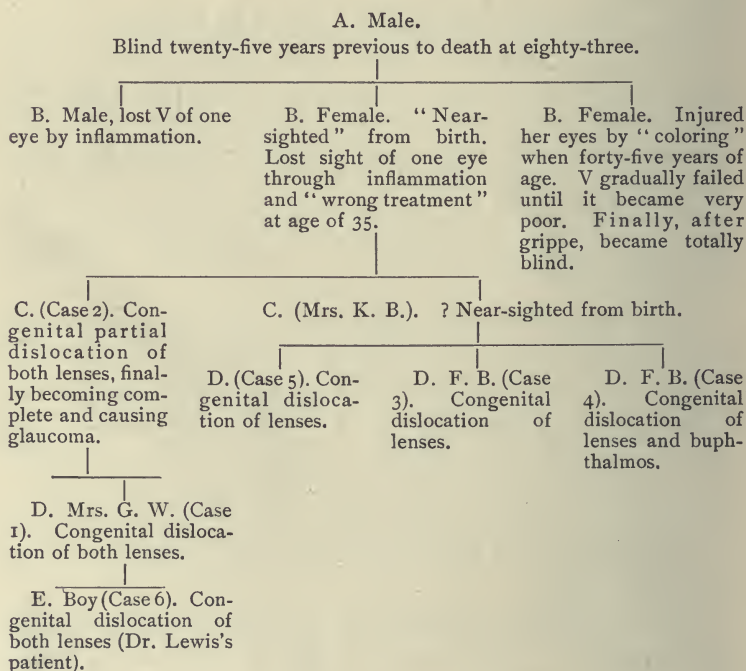
It is of interest to note that in the majority of the cases mentioned the portion of the pupil unoccupied by the lens was utilized in the act of vision, No. 3 being the only patient in whom the lens was utilized. It is also of interest in this case to note that the edge of the dislocated lens could be seen in one eye only, although dislocation in low degree was doubtless present in the other eye also, as indicated by the tremulousness of the iris and the dark rim in the lower part of the pupil.

I append below a family tree in so far as I have been able to obtain it. This contains five generations, in every one of which blindness of one or both eyes of at least one



individual has been known to occur. In the last three generations the defective sight has been proven to be due to congenital dislocation of the lens, in two cases complicated by glaucoma—in one case in the infantile form known as buphthalmos, and in the other case as an acute glaucoma, complicating and doubtless resulting from the partial dislocation of the lens, being converted into a complete dislocation.

I have designated the generations as A, B, C, D, and E. It seems very probable that the male and sole representative of the A generation, who was blind twenty-five years previous to his death, may also have suffered from glaucoma complicating congenital cataract, and that his daughter, who was near-sighted from birth and lost the sight of one eye from inflammation at the age of thirty-five, was a victim of the same catastrophe, but it has, of course, been impossible to arrive at the accurate facts in these cases.



# SYSTEMATIC REPORT ON THE PROGRESS OF OPHTHALMOLOGY IN THE SECOND AND THIRD QUARTERS OF THE YEAR 1902.

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PINTO, Lisbon ; Dr. HEINRICH  
SCHULZ ; and others.

Translated by Dr. WARD A. HOLDEN.

(Continued from page 414.)

## XII.—CORNEA, SCLERA, ANTERIOR CHAMBER.

342. **Keyser.** On a case of congenital greenish discoloration of the cor-  
nea. *Klin. Monatsbl. f. Augenheilk.*, xl., 11, p. 22.

343. **Augstein.** Vascular studies of the cornea and iris. *Zeitschr. f.*  
*Augenheilk.*, viii., 3-4.

344. **Koerber.** Remarks on the so-called nodular and grill-like corneal  
degeneration. *Ibid.*, viii., 3, p. 340.

345. **Wehowski.** On opacities of the cornea from folding. *Inaug. Dis-*  
*sert.*, 1901, Greifswald.

346. **De Vries.** Pyramidal cataract adherent to the cornea, with remarks  
on the thickness to which the membrane of Descemet may attain. *Graefe's*  
*Archiv*, liv., 3, p. 500.

347. **Knaebel.** On infantile keratomalacia. *Inaug. Dissert.*, 1901, Tü-  
bingen.

348. **Panas.** On certain dystrophies of the cornea and the limbus of the conjunctiva. *Arch. d'opht.*, xxii., 5, p. 293.
349. **Terrien.** Pathological anatomy and pathogenesis of congenital keratitis. *Ibid.*, p. 329.
350. **Mainzer.** A contribution to the knowledge of the etiology of par-enchymatous keratitis. *Inaug. Dissert.*, 1901, Tübingen.
351. **Zur Nedden.** Clinical and bacteriological investigations on marginal ulcer of the cornea. *Graefe's Archiv*, liv., p. 1.
352. **Klein, S.** On posterior ulcer of the cornea. *Wiener. med. Wochenschr.*, 1902, No. 11.
353. **Panas.** Suppurative keratitis of infectious origin. *Arch. d'opht.*, xxii., 6, p. 357.
354. **Piroschkoff.** On the treatment of purulent affections of the cornea with the actinic solar rays. *Wjest. Ophth.*, 1902, May-June.
355. **Römer.** Clinical experiments in regard to a serum therapy of serpent ulcer after investigations on pneumococcus immunity. *Graefe's Archiv*, liv., p. 99.
356. **Menschig.** On linear cauterization of the eye. *Reichs-med. Anzeiger*, Sept. 12, 1902.
357. **Suroff.** On the question of transplantation of the cornea. *Russky Wratsch*, 1902, No. 29.
358. **Seggel.** The dependence of corneal astigmatism upon the conformation of the skull. *Arch. f. Augenheilk.*, xlv., 3, p. 161.
359. **Hirschberg.** A new operation for keratoconus. *Berl. klin. Wochenschr.*, 1902, 20, p. 475; and *Centralbl. f. prakt. Augenheilk.*, xxvi., p. 199.
360. **Janssen.** On the correction of keratoconus. *Compt. rend. de l'acad. des sciences de Paris*, May 5, 1902.
361. **Lodato.** Observations on the refraction and optical correction of keratoconus. *Arch. di Ottalm.*, ix., 5, 6.
362. **De Wecker.** Tattooing in place of prothesis. *Die ophth. Klinik*, vi., No. 12, 1902; and *Klin. Monatsbl. f. Augenheilk.*, xl., 374.
363. **Dor.** Cyst of the cornea. *Soc. d. sciences méd. de Lyon*, July, 1902.
364. **Gelpke.** On perforating wounds of the sclera, their treatment and prognosis. *Beiträge zur Augenheilk.*, 52, p. 132.
365. **Friedenwald, H.** Deposits on the posterior surface of the cornea; their clinical significance. *Centralbl. f. prakt. Augenheilk.*, xxvi., p. 266.
366. **Parsons, J. Herbert.** Annular scleritis. *Ophth. Review*, July, 1902.
367. **Jardine.** Opacity of the cornea in new-born children. *Brit. Med. Jour.*, April 5, 1902.
368. **Westcott.** An additional case of conical cornea in which vision was improved by convex cylinders. *Ophth. Record*, March, 1902.
369. **Parker, H. C.** Operative interference in corneal complications of gonorrhœal ophthalmia. Twelve cases. *Ophth. Record*, April, 1902.

In a man of twenty-three, **KEYSER** (342) saw a dark greenish brown discoloration of the periphery of the cornea, possibly congenital. Examined with the loupe the ring zone appeared as a

regular arrangement of fine yellow spots deep in the cornea. Both eyes were free from other changes.

AUGSTEIN (343), after making studies with the loupe on living eyes and pathological examinations, divided the pathological vessels of the cornea into subepithelial and lamellar, the different forms dividing dichotomously or in the birch-twig fashion, according to their location in the cornea. The subepithelial tend to disappear, the deep to remain permanently. All the lamellar vessels indicate an involvement of the uveal tract in the inflammatory process. In the resorption, both varieties of vessels exhibit a circulation of red blood corpuscles under the loupe. This is due to a slowing of the current.

WEHOWSKI (345), in two phthisical eyes in which the small cornea was diffusely cloudy and had deep stripes of denser opacity, found microscopically that the epithelium and Bowman's membrane were intact, the parenchyma not œdematous, the membrane of Descemet with the deep layers of the parenchyma corresponding to the stripes of dense opacity bulged backward, and the endothelium consisting of a single stratum of cells. This is the ordinary condition of folding of Descemet's membrane found in phthisical eyes. Efforts to produce the condition in rabbits were unsuccessful.

DE VRIES (346) examined an eye in which, presumably after a perforating central ulcer of the cornea, the lens was found to be attached to the cornea by a tract of tissue and the endothelium, and also the membrane of Descemet had passed over upon this tract as well as upon the lens. The case proves that the membrane of Descemet is a cuticular formation proceeding from the endothelium.

KNAEBEL (347) studied 27 cases of keratomalacia in infants under six months of age—15 boys and 3 girls, and believes that no specific micro-organism is the cause of the disease. In 3 cases, besides the xerosis bacillus, staphylococci were present, and in 1 severe case of general pneumococcus infection this was found in the cornea. An accompanying xerosis of the conjunctiva was wanting in but 3 cases. Of the 18 infants, mostly poorly nourished and with intestinal catarrh, 9 remained alive, but of the 13 affected eyes 11 became completely blind. The therapy consisted in improving the nutrition and using locally eserine, protargol, iodoform, hot fomentations, etc., yet the eyes grew worse.



As dystrophies of the cornea, PANAS (348) designated gerontoxon, pterygium, pinguecula, and "kératite chimique," a form due to hyaline degeneration, described by Kamocki (*Arch. f. Augenheilk.*, xxv., p. 209), which is cured by curetting the affected spots. Gerontoxon, when it comes on in the form of two concentric rings, is a sign of arteriosclerosis, gout, rheumatism, or alcoholism. Even in persons from twenty-five to forty years it indicates one of these affections. In order to show the relation between gerontoxon and pterygium, Panas cites the case of an arthritic patient who had in one eye a pterygium which extended to the double gerontoxon, the two rings of which came together at this point. Panas confirmed the observation of Takayasu, that sudan stains the arcus black, indicating its fatty nature, but in old cases he found hyaline deposits also. V. MITTELSTÄDT.

TERRIEN'S (349) patient was an infant, normally born, with white corneal opacities in both eyes. Death occurred on the eighth day. He found a pronounced thickening of the cornea, the anterior layers being but little changed and there being an extensive ulcer of the posterior surface with vascularization of the deeper layers. The iris lying close to the cornea had many granular formations in its anterior surface, and, like the rest of the uveal tract, a marked inflammatory infiltration. The choroid with venous hyperæmia was increased to three times its normal thickness.

The affection of the uveal tract, which was a torpid irido-cyclitis, was, in the author's opinion, the cause of the deep interstitial keratitis.

In a second infant, eight days old, the same affection of the uveal tract was found without involvement of the cornea.

In the first case syphilis could be excluded, but there had been albuminuria since the seventh month of pregnancy, so that the author attributes the affection to the disturbances of circulation in the foetal eye. In the second case details are not given, yet here also there were disturbances in the placental circulation.

V. MITTELSTÄDT.

MAINZER (350) found in the Tübingen clinic parenchymatous keratitis, particularly between the ages of six and fifteen, chiefly in females. In 61 per cent. of the cases hereditary syphilis was found, and in 6 per cent. acquired syphilis. In many cases the etiology was not clear. There was no reason to suppose the existence of tuberculosis or any other etiological factor in any of the

cases. Hutchinson's teeth were found in only 26 per cent. of the patients with second teeth, and in 13 per cent. of those with their first teeth. In all these cases (39 per cent.) there were definite evidences of hereditary syphilis, so that these teeth may be regarded as a sure proof of the existence of hereditary syphilis.

ZUR NEDDEN (351) found a new bacillus in a series of thirty-three corneal ulcers of a catarrhal nature. The ulcers were near the margin of the cornea, crescent-shaped or oval, and sometimes in the form of scattered small infiltrations. These were not rapidly progressive and spread in a ring form rather than extended into the depth of the cornea. There was rarely hypopyon but often phlyctenulæ. In the latter also the author found the bacillus, which stood near the colon varieties. The bacillus was sometimes found with difficulty in the small ulcers, and was often not present where the author expected to find it. Again it was found, together with other bacilli, in severe ulcers but never in conjunctival or lachrymal secretion. When injected into the tissues, inoculation experiments resulted positively, and the author believes the bacillus to be the cause of marginal ulcers.

KLEIN (352) reports two cases of posterior ulcers of the cornea without the existence of anterior ulcers. These cases make it possible to understand the existence of anterior synechiæ after the healing of corneal ulcers without perforation and escape of the aqueous.

PIROSKOFF (354) used the treatment with the actinic rays of the sun, recommended by Nesnamoff, in 22 cases of corneal ulcer, mostly with hypopyon, and obtained complete recovery in 13 cases in from one to five sittings, in 8 cases not followed to the end considerable improvement, in 4 cases no change, and in 4 the ulcers grew worse. The treatment is not unpleasant to the patient. The sittings last from two to six or even eight minutes.

HIRSCHMANN.

RÖMER (355), in his exhaustive treatise, traces the introduction of experiments in immunizing against the pneumococcus and gives a critical review of previous studies. He had prepared by Merck a pneumococcus serum obtained from various species of animals which contained the greatest possible number of immunizing elements and brought us a step forward in the treatment of croupous pneumonia in man.

In the ophthalmological section of his paper he discusses the pneumococcus of Fraenkel in serpent ulcer and the possibility of

securing immunity or improvement by serum injections. Some clinical experiments on man were chiefly of interest in showing that injections of the serum did no harm. Their effect on serpent ulcer will require a great number of observations. Experiments on animals showed that the eye took part in the general immunization.

MENSCHIG (356) cured keratitis, iritis, and hypopyon by cauterizing the inferior cul-de-sac in a fine longitudinal line with the stick of nitrate of silver. He used also atropine and cocaine, hot fomentations and a bandage. The improvement always was noticeable the following day.

In order to secure better nutrition after transplanting a cornea, SUROFF (357) takes with the cornea a broad strip of surrounding conjunctiva. He splits the upper half of the cornea into two layers. The posterior layer is left in place, while the anterior layer of the upper half, with the entire thickness of the lower half of the cornea, together with the ring of conjunctiva, is transplanted to the other eye, which has been prepared in exactly the same way and an iridectomy done downward. This operation was done by the author in six hens, two dogs, and fourteen rabbits. In two-thirds of the cases the results were satisfactory both in regard to healing and in regard to the subsequent clearing up of the transplanted cornea, which at first is cloudy and then in the lower half clears up so far that the pupil becomes visible and the red reflex of the fundus can be seen. The upper split half of the cornea remains cloudy permanently.

HIRSCHMANN.

SEGGE (358) found astigmatism against the rule chiefly in long faces, and astigmatism with the rule rather in broad faces (brachycephaly). He presents accurate measurements of a person with facial asymmetry and a correspondingly different astigmatism in the two eyes.

HIRSCHBERG (359) believes that in place of the long-practised superficial cauterization of the apex of the cone with subsequent tattooing, tattooing alone is sufficiently helpful optically and organically, since it flattens the cone and prevents vision through it. In three or four sittings at intervals of two or three weeks he tattoos the apex, which usually lies beneath the centre of the cornea, and also a ring- or half-ring-shaped area of the pupillary region of the cornea, producing the optical effect of medicamentous miosis.



The improvement in vision is considerable and lasts for years. In many cases he flattens the apex with the galvano-cautery and tattoos the white scar. Opening of the anterior chamber is to be avoided.

JANSSEN (360) compares a cornea with keratoconus to a slightly curved cornea before which a parabolic lens is placed. Therefore keratoconus should be corrected by a lens whose anterior radius corresponds to the spherical anomaly of curvature and that of its posterior (parabolic) surface to the keratoconus.

BERGER.

DE WECKER (362) would as far as possible limit enucleation to cases of injury which threaten sympathetic inflammation, and to cases of tumor. Prothesis is reserved for eyes which have become small spontaneously or after operation. The shrinking according to de Wecker is not particularly noticeable after all the recti have been tenotomized. These become attached again and good motility is restored. The tattooing must be artistically done. After this procedure many patients can dispense with their artificial eyes.

DOR (363) presented a patient in whom there was on the right eye a cystic elevation of the corneal epithelium as large as a pea. Vesicles of this sort had appeared 20-30 times in this same patient. The elevation appears each time rather suddenly, increases in extent, and finally the vesicle bursts. Two years before, this patient had iritis. There are but two cases in the literature in which so large vesicles existed.

BERGER.

FRIEDENWALD (365) found deposits on Descemet's membrane constantly in iritis and in 31 out of 38 cases of exudative choroiditis. The apparent serous iritis, therefore, is in connection with an exudative process which runs its course in some deeper part.

PARSONS (366) says this, unlike ordinary scleritis, is a disease of advanced age; all the recorded cases have been in people over sixty years of age, and most of them are women.

Both eyes are usually affected and the disease is very chronic. Many of the eyes are lost and can hence be readily examined. The disease commences at the corneal margin and spreads on both sides and in advanced cases reaches the equator posteriorly and invades the cornea anteriorly. Besides the cornea the uveal tract is usually inflamed, though this is probably a sequel rather



than a causal agent. The extreme chronicity of all forms of the disease point to a specific inflammatory process, the advance of which is doubtless impeded by the extreme resistance of scleral tissue to invasion of all kinds. MARSHALL.

JARDINE (367) draws attention to the cases of opacity of the cornea occurring in the new-born after forceps delivery, several cases of which have recently been reported at the Ophthalmological Society of the United Kingdom. He records two other cases.

In one he noticed immediately after birth a marked linear opacity running vertically across the cornea and a few fainter spots at one side. There was considerable hemorrhage into the anterior chamber. In the other case a faint opacity showed itself three days after delivery. He considers the condition caused by pressure with forceps and in most of the cases delivery was accomplished in the Walcher position. MARSHALL.

Of the twelve cases of Saemish operation for ulceration of cornea complicating gonorrhœal ophthalmia reported by PARKER (369), only one resulted in loss of the eye. In the others the cornea rapidly cleared. The operation is indicated when the ulceration is extending rapidly and tending to perforate.

ALLING.

Sections XIII.—XVIII. Reviewed by DR. O. BRECHT, Berlin.

### XIII.—LENS.

370. **Stood.** Artificial ripening of senile cataract in the unbroken capsule by Förster's method. *Deutsche med. Wochenschr.*, xxviii., p. 448.

371. **Schmidt, Heinrich.** A case of recovery from panophthalmitis after cataract extraction due to the introduction of iodoform into the vitreous. *Zeitschr. f. Augenheilk.*, vii., p. 295.

372. **Terrien.** The manner of cicatrization of the capsule of the lens after injuries of that membrane. *Arch. d'opht.*, xxii., 7, p. 452.

373. **Wokenius.** A contribution to the subject of subconjunctival discission of simple secondary cataract. *Zeitschr. f. Augenheilk.*, vii., p. 277.

374. **Panas.** On operative intervention in cases of secondary cataract. *Arch. d'opht.*, xxii., 9, p. 549.

375. **Hocquard.** Anatomical study of a secondary cataract after extraction without inflammatory reaction in man. *Ibid.*, 7, p. 435.

376. **Coffer.** On rupture of the posterior capsule of the lens. *Ann. di Ottalm.*, xxxi., 3-5.

377. **v. Hippel, E.** On different forms of congenital cataract and their relations to one another. *Graef's Arch.*, liv., p. 48.

378. **Pergens.** Lenticonus posterior in man. *Zeitschr. f. Augenheilk.*, vii., p. 451.

379. **Hubbell.** Jacques Daviel and the beginning of the modern operation of extraction of cataract. An address commemorative of the third semi-centennial anniversary of the publication of the first description of the operation. *Four. Am. Med. Assoc.*, July 26, 1902.

380. **Hunter.** Two cases of hereditary congenital cataract with family history. General remarks on needling and discission in soft and secondary (membranous) cataract. *N. Y. Eye and Ear Infirmary Reports*, Jan., 1902.

381. **Suker.** Is the dislocation of the lens into the vitreous ever justifiable? *Am. Jour. of Ophth.*, June, 1902.

STOOD (370) has done extraction 130 times after previously performing Förster's massage. Opacity of the lens came on most surely in cortico-nuclear cataracts, then in nuclear cataracts up to the sixty-fifth year, and less certainly in older people. Three cases of lamellar cataract in patients between forty and fifty remained unchanged. In 2 cases iritis serosa developed with sympathetic ophthalmia and loss of the second eye; in 3 cases there was injection which could not be attributed to the operation. The resulting vision was on the average better than in cases of spontaneous ripening. Secondary cataract is found twice as often in the cases artificially ripened. The author recommends the procedure for unripe cataracts, exclusive of the lamellar and nuclear forms, up to the age of sixty-five.

SCHMIDT (371), in an infected eye after extraction which would have been destroyed, obtained a good result by introducing iodoform into the vitreous, and he recommends this procedure in suitable cases.

TERRIEN (372) shows that even in clean linear wounds of the anterior capsule produced by the narrow knife without causing opacity of the lens, there is no actual healing of the margins of the wound, but a sort of interstitial tissue is produced by the sub-capsular epithelial cells, upon which, even without a preceding iritis, pigment masses may be found. V. MITTELSTÄDT.

WOKENIUS (373) on the basis of 244 operations for secondary cataract done in the Koenigsburg University eye clinic, recommends Kuhnt's procedure of subconjunctival discission in simple secondary cataract and the subconjunctival operation with two knives in the spongy form of secondary cataract. The vision increased on an average from 19 per cent. to 52 per cent., perfect vision being regarded as 100 per cent. Disturbed healing occurred in 22 cases (or 9 per cent.), and glaucoma was never observed. The advantages of the operation are to be sought for in the avoid-

ance of disturbing the uveal tract and of deep injury of the vitreous, as well as in the making of a single large split in the membrane.

In place of discission of secondary cataract, which is often difficult to perform, unsatisfactory in result, and followed frequently by cyclitis, glaucoma, and detachment of the retina, PANAS (374) recommended extraction, which he had done with good results for years, an operation performed in the eighteenth century by Pellier de Quengsy.

After opening the anterior chamber with a lance, making a section 8-10mm broad at the corneal margin, Panas introduced a forceps resembling Liebreich's, one branch of which ended in a sharp point that pierced the secondary cataract, and when the forceps were closed the membrane was included between the branches, and after being gradually loosened was extracted. Disturbances of the ciliary body are not to be feared since the zonula fibres always rupture at the margin of the secondary cataract. In case of adhesions, an iridectomy may first be done or an iridocapsulotomy. The bad results that follow discission were very rarely observed by Panas in a series of at least a thousand operations for secondary cataract.

V. MITTELSTÄDT.

HOCQUARD (375) found, in seven eyes from which a cataract had been extracted, a marked broadening of the anterior capsule due to the traction of the zonula fibres, so that the capsule almost touched the ciliary processes. From this he concluded that a narrowing of the circumlenticular space cannot be the cause of glaucoma and that the zonula fibres are normally in a continued state of tension. The anterior capsule, after its division with the cystitome, often rolls outward. The zonular attachments are always clearly recognizable. Just as in young animals with injuries of the lens there is found in patients operated on for cataract a proliferation of the subcapsular epithelium with the formation of lens fibres. The process in the latter case, however, is much slower and irregular and does not reach a high grade.

The portions of the lens left between the two sheets of capsule and portions of the nuclear zone form the true secondary cataract, which is to be distinguished from the secondary cataract due to exudation upon the capsule following iritis. In cases of very thin secondary cataract a simple incision is alone necessary and the traction of the zonula fibres widens this. This action of the zonula fibres is wanting when there are posterior synechiæ



and in cases of thick secondary cataract. In such cases the great resistance is due to the tissue of fibrous nature arising from the subcapsular epithelium and the occasional calcified myelin. In extracting secondary cataract, in case strong adhesions to the iris do not exist, one need not fear traction upon the ciliary body, since the capsular sac always comes away without zonula fibres, and either is torn itself or is separated from the zone at their place of insertion from the zonula fibres which remain attached to the ciliary body.

V. MITTELSTÄDT.

COFLER (376) reports a case of rupture of the posterior capsule after the action of blunt force upon the eye, which is of the greater interest from the fact that three years before the injury a polar cataract (congenital?) was diagnosed. The rupture seems undoubtedly to have been due to the injury.

KRAHNSTÖVER.

V. HIPPEL (377) found in three young rabbits of the same brood in all six eyes which showed, four weeks after birth, congenital changes as follows: capsular cataract in six, with chalky deposits in three, pronounced central cataract in two, and complete cataract in three. Furthermore, in all six eyes there were ribbon-shaped corneal opacities, more or less pronounced posterior synechiæ, and a displacement inwards of the pars ciliaris retinæ and the ciliary processes. The author assumes an inflammation to have been the cause of all the changes.

PERGENS (378) found, accidentally, in an eye long blind and enucleated for glaucoma, a lenticonus posterior with a rupture of the capsule near the posterior pole. The nucleus was displaced backward. There was no trace of a hyaloid artery.

HUNTER (380) speaks of a family consisting of sixteen individuals, eight of whom had double congenital cataracts. He uses a narrow Graefe knife for discission of secondary cataract, repeating the operation in second and third sessions.

ALLING.

There has been a recent revival of the obsolete method of treating cataracts by couching. SUKER (381) takes the position that the operation may sometimes be advisable among the following cases: the insane, epileptics, hæmophilics, tremulous or fluid vitreous without choroiditis or retinitis, incurable dacryo-cysto-blennorrhœa or conjunctivitis, extreme old age, incurable bronchitis and cough, where one eye was lost by suppuration and indications point to same fate for other, in shrunken and secondary



cataracts—*i. e.*, secondary to some inflammatory reaction, in partial posterior dislocations with tremulous iris. While granting that the procedure should be an exceptional one, he believes that it has a place in ophthalmic surgery. ALLING.

## XIV.—IRIS.

382. **Panas.** Gummata of the ciliary body, particularly early ones. *Arch. d'opht.*, xxii., 8, p. 485.

383. **Sawitsch.** A case of atypical coloboma of the iris. *Wojenno Med. Journ.*, June, 1902.

384. **Praun.** Triangular defect in the iris after injury. *Centralbl. f. prakt. Augenheilk.*, xxx., p. 269.

385. **Friedenwald.** Tuberculosis of the iris. *Amer. Medicine*, July 5, 1902.

386. **Alt.** On intraocular epithelial new formations. *Amer. Journ. Ophth.*, Apr., 1902.

PANAS (382) reported two observations of gumma of the ciliary body, which made their appearance in the secondary stage together with iritis. The prognosis is bad even when the patient is treated early with iodides and mercury. Panas prefers the intramuscular injection of an oily solution of biniodide of mercury. Complete recovery may take place.

Even in cases in which it is uncertain whether the disease is gumma or tuberculosis the same treatment is indicated, since tuberculosis being a bacillary disease is favorably influenced by it.

He reported, also, two cases of specific iritis in which there were numerous synechiæ without particular signs of irritation or pain, but with occasional increase in tension and blurring in vision and limitation of the field. Panas attributes this form of glaucoma less to the iritis than to vascular changes due to syphilis. Treatment with biniodide of mercury may perhaps render operation unnecessary.

The coloboma of the iris in SAWITSCH'S (383) case was horizontal. No intraocular changes.  $H = 2.5$ ;  $V = \frac{2}{3}\%$ .

PRAUN (384) saw eight years after a blow with a whip a triangular defect of the iris, the portion of the lens behind it being cloudy and somewhat shrunken, while elsewhere it was clear. There was a small yellowish-white, black-margined patch in the macula.

The case reported by FRIEDENWALD (385) was in a boy of sixteen who showed serous iritis with synechiæ, hypopyon, and whitish elevations on the iris together with punctate keratitis. Transplantation experiments in the eye of a rabbit were negative. The tubercles disappeared. The other case, a man of twenty-two, presented typical miliary tubercles of the iris with keratitis punctata. Although a syphilitic, lesions supposed to be tuberculous were found in pleura and pericardium at autopsy. ALLING.

ALT (386) contends that there is no doubt but that epithelial new growths can and do occur primarily within the eyeball, springing from the two epithelial layers of the ciliary body or the iris. On the whole they seem to be of benign character.

ALLING.

#### XV.—CHOROID.

387. **Greeff.** Tuberculosis of the choroid. *Fortschritte der Medicin*, 1902, 17.

388. **Stock.** A case of solitary tubercle of the choroid. *Vereinsbericht der Münch. med. Wochenschr.*, 1902, No. 25, p. 1067.

389. **Schmidt-Rimpler.** Diagnosis of sarcoma of the choroid. *Münch. med. Wochenschr.*, 1902, No. 29.

390. **Fehr.** Pigment deposits upon the iris and membrane of Descemet as an early symptom of sarcoma of the choroid. *Centralbl. f. prakt. Augenheilk.*, xxvi., p. 129.

391. **Darocque and Petit.** Sarcoma of the choroid invading the orbit, the frontal sinus, and the infero-orbital canal. Exenteration of the orbit. Curettage of the sinus. Recovery. Intraorbital injections of vaselin. *Rev. méd. de Normandie*, Oct., 1901.

392. **Steffens.** On an angioma of the choroid, with extensive ossification and teleangiectasis of the face. *Klin. Monatsbl. f. Augenheilk.*, xl., 11, p. 113.

393. **v. d. Hoeve.** Remarks on bilateral coloboma of the choroid in the macular region. *Ned. Tydschr. v. Geneesk.*, ii., No. 5, 1902.

394. **Krauss, F.** A clinical and pathological report of two cases of choroidal sarcoma, diagnosed in the first stage and removed by enucleation. No recurrence. *Annals of Ophth.*, July, 1902.

GREEFF (387) gives a résumé of our present knowledge of tuberculosis of the choroid. Miliary tuberculosis was described in 1858 by Manz and is a frequent and well-known affection. Chronic tuberculosis has recently excited more attention; it appears either as a diffuse inflammation or as a circumscribed tumor. Greeff agrees with v. Michel that the ordinary chorio-retinitis disseminata is frequently to be considered a tuberculous

affection when other causes cannot be found, or when several members of a family have tuberculosis, or when there is any evidence of pulmonary tuberculosis. A solitary tubercle may lead to detachment of the choroid or retina, so that in cases of spontaneous detachment of the retina, one must bear in mind the possibility of a tuberculous tumor of the choroid.

STOCK'S (388) case was in a girl of seventeen, with pronounced tuberculosis at the apices and tuberculous pleuritis, who had long complained of failing vision in one eye and for four days had been blind. The eyeball appeared unchanged. In the choroid one saw a large white, nodular tumor springing from a spot beneath the disc, and below it a floating detachment of the retina. The absolute clearness of the media and the lack of irritation were remarkable. Microscopic examination revealed tuberculosis with great numbers of giant cells and central caseation. In the retina, disc, and distant portions of the choroid small tubercles were found. The surrounding tissues were but little infiltrated. On the outer side of the sclera there was a small collection of leucocytes and a slight increase of nuclei in the optic nerve. The vitreous was free. This case supported the view that solitary tubercle of the choroid almost always is associated with tuberculosis of other organs, while this is not the case with tuberculosis of the iris and the appendages of the eye.

SCHMIDT-RIMPLER (389), in view of the difficulty of distinguishing between sarcoma of the choroid and subretinal cysticercus and simple detachment in cases of circumscribed choroiditis, suggests the methodical use of the sound, with which it is possible to make out the increased resistance of the sclera which often exists at the site of the tumor, and this may be done even at the posterior pole after making a small incision into the conjunctiva.

FEHR (390), fifteen months before the diagnosis was made of a melano-sarcoma of the choroid extending into the ciliary body, found deposits of pigment on the iris and Descemet's membrane. After the enucleation, preceded at the wish of the patient by a puncture, there was recurrence in the conjunctiva notwithstanding the careful removal of the punctured spot. The author concludes that pigment deposits in eyes which have not been injured, inflamed, or degenerated should excite suspicion of tumor.

DAROCQUE and PETIT (391) report on a case of sarcoma of the choroid in a woman of thirty-eight, in which the tumor had



entered the orbit, frontal sinus, and infraorbital canal. It was possible to remove the tumor completely, and an attempt was made to transplant a rabbit's eye, but this was unsuccessful. Then vaselin was injected into the orbit according to Gersung's method and in this way a satisfactory stump was obtained for the introduction of an artificial eye. BERGER.

STEFFENS (392) found in a man of nineteen, besides a large vascular nævus of the left half of the face, a large partly ossified angioma of the choroid in the left eye with apparently secondary changes, such as a deeply excavated atrophic optic nerve, calcification of the shrunken lens, partial thickening of the ciliary muscle apparently due to teleangiectasis and scleritis.

V. D. HOEVE (393) observed a case of coloboma of the choroid in the macular region. Since the retina functionated well and was well nourished, he concluded that, since the chorio-capillaris was wanting, the retinal vessels were able to nourish the macula. JITTA.

#### XVI.—VITREOUS.

395. **Stadfeldt.** Idiopathic recurrent hemorrhage into the vitreous. *Bibl. f. Laeger.*, April, 1902.

396. **Hirota.** Bacteriological investigations on panophthalmitis. *Zeitschr. f. Augenheilk.*, vii., p. 459.

397. **Jennings.** A remarkable vascular growth into the vitreous. *Annals of Ophth.*, July, 1902.

STADFELDT'S (395) patient, a man of thirty-six, became blind suddenly in the left eye without any apparent cause. Four and a half months later he noticed a failure of vision in the other eye, and in six weeks this eye was entirely blind. The history threw no light upon the cause of the affection. When examined, extensive hemorrhages into the vitreous were found. Therapy, including foot-baths, rest in bed, a pressure bandage, salicylates, iodide of potassium, and subconjunctival injections of salt solution, was of no avail. Two years after the beginning of the trouble, when all treatment had been given up, the sight of the right eye began to improve, and in the course of some months rose to  $\frac{6}{12}$ . At the same time the blood in this eye became absorbed. In the left eye no improvement took place.

The author discusses the various views as to etiology, symptomatology, course, prognosis, and treatment of idiopathic, recurrent juvenile hemorrhage into the vitreous. DALÉN.



HIROTA (396), in three cases of panophthalmitis with suppuration in the tear sac, found in the pus from the eye the pneumococcus of Fraenkel in pure culture or nearly so, both in the beginning and two or three weeks later when the pneumococci proved to be very virulent for white mice.

The growth described by JENNINGS (397) consisted of three vessels which passed from the optic nerve to a small patch of transparent connective tissue in the vitreous. The vessels then subdivided, forming a delicate and extensive meshwork. The growth disappeared, but the vitreous became disorganized and the sight was lost. There was a previous history of hemorrhagic retinitis in the case.

ALLING.

#### XVII.—GLAUCOMA.

398. **Neese.** Glaucoma operations according to Jonnesco and v. Graefe's iridectomy. *Centralbl. f. pr. Augenheilk.*, xxvi., p. 105.

399. **Strzeminski.** Glaucoma following acute iritis. *Recueil d'ophtal.*, xxiv., p. 516.

400. **Venneman.** Remarks on a case of buphthalmus. *Soc. belge d'ophtal.*, April 26, 1902.

401. **Querenghi.** On glaucoma and its operability without iridectomy. *Tribuna medica*, Jan.-Feb., 1901.

402. **Spartaro.** On the treatment of hydrophthalmus. *La clinica oculista*, June, 1902.

403. **Ziehe and Axenfeld.** Resection of the sympathetic in glaucoma. C. Marhold, Halle a. S., 1901.

404. **Hoor.** The indications for resection of the sympathetic in glaucoma. *Arch. f. Augenheilk.*, xlv., p. 277.

405. **Hoor.** Contributions to the subject of resection of the sympathetic in glaucoma. *Wien. klin. Wochenschr.*, xv., No. 36, p. 907.

406. **Rohmer.** Some observations on sympathectomy in glaucoma. *Ann. d'ocul.*, cxxvii., p. 328.

407. **Rohmer.** On extirpation of the ciliary ganglion. *Ibid.*, cxxviii., p. 1.

408. **Terrien.** A case of extirpation of the ciliary ganglion. *Bull. de la soc. de chirurg. de Paris*, April 23, 1902.

409. **Taylor, C. Bell.** A case of acute glaucoma. *Lancet*, Nov. 22, 1902.

410. **Friedenwald.** Notes on the visual field in glaucoma. *Annals of Ophth.*, April, 1902.

411. **Webster.** Sclerotomy, anterior and posterior. When indicated in glaucoma. Method of operating. *Med. News*, May 17, 1902.

412. **Burnett, Swan M.** The manner of making an iridectomy in acute glaucoma. *Am. Jour. of Ophth.*, April, 1902.

413. **Standish.** A compilation of thirty-two cases of glaucoma reported to the New England Ophthalmological Society since its foundation. The danger of mydriasis. *Ophth. Record*, May, 1902.

NEESE (398) treated a woman with subacute glaucoma who apparently had had the corresponding sympathetic ganglion removed and a sclerotomy done. He did an iridectomy and relieved the unbearable pain for over a year. When the tension increased again and occipital pains returned, these were relieved by sclerotomy. The author concludes with Axenfeld that resection of the sympathetic is indicated only in simple glaucoma and when iridectomy has been unsuccessful. In absolute glaucoma it is to be avoided.

The interesting report of VENNEMAN (400) is not adapted for an abstract. Of particular importance may be mentioned the results of his pathological examinations, which show that the most extensive changes in the external ocular membrane lie in the sclero-corneal zone. The latter is so distended that Desce-met's membrane ends 4-5mm external to the peripheral end of Bowman's membrane. Fontana's spaces are greatly dilated and the meshwork is very well marked. Schlemm's canal is filled with blood and distended longitudinally. In the cornea only the posterior layers have a lamellar structure, the anterior layers consisting of an irregular fibrous network with greatly changed corneal corpuscles.

QUERENGHI (401) under complete miosis passes a narrow Graefe knife into the posterior chamber 2mm behind the corneal margin, and after perforating the sclera he depresses the handle of the knife and pushes the blade 5-6mm farther, then with a sawing motion he cuts through the choroid from within outward. In this manner the author believes that he provides a sufficient communication between the posterior chamber and the choroidal space. In a number of cases of glaucoma he obtained good results.

KRAHNSTÖVER.

SPARTARO (402) gives extensive incision of the angle of the anterior chamber the preference over all other operative methods in hydrophthalmus and obtains good vision.

KRAHNSTÖVER.

ZIEHE and AXENFELD (403) in their monograph of eighty-four pages treat in a clear and exhaustive fashion of the timely question of resection of the sympathetic in glaucoma. After reporting

in detail upon 5 cases so treated in the Rostock clinic, they add 50 cases collected from literature. Their conclusions are: the operation is not dangerous, only one death having occurred in seventy-four patients operated upon; pareses of the upper lids or of the muscles of swallowing are transient. Some of the eyes are improved for months; in others the condition remains stationary, in others no benefit is derived from the operation. Direct injury, however, has not been observed. Resection is not indicated in acute inflammatory glaucoma except when iridectomy is refused, or had acted badly in the first eye, or when, in spite of iridectomy, the glaucoma recurs or progresses. In hemorrhagic glaucoma resection may be tried. In chronic inflammatory glaucoma and in simple glaucoma resection is indicated after iridectomy in chronic cases. Extirpation of the sympathetic without iridectomy is generally contra-indicated and is only justified: (1) when iridectomy or iridotomy is refused; (2) when iridectomy has injured the other eye; (3) in hemorrhagic glaucoma; (4) in simple glaucoma with marked diminution of vision; and (5) in hydrophthalmus after multiple sclerotomies. Resection in cases of absolute glaucoma is only indicated when the blindness has existed but a short time, or when the affected eye is the last. It is uncertain whether resection has a prophylactic effect. After-treatment with miotics is always advisable. When the process advances in spite of iridectomy, resection should be done soon, since it apparently acts better in an early stage of the disease than in a later.

HOOR (404) discusses the monograph of Ziehe-Axenfeld. These authors and others advise resection of the sympathetic when an acute inflammatory glaucoma recurs or goes on after an iridectomy. Hoor advises in such cases sclerotomy first, when this is not efficacious a second iridectomy, and then, if necessary, the resection of the sympathetic. Hoor agrees with the others in regard to simple glaucoma. He advises extirpation when the vision is considerably decreased, and especially when the field of vision is much narrowed, since iridectomy then mostly works injury and sclerotomy often checks the process and sometimes cures it. In glaucoma in children he has seen good and lasting results from sclerotomy, and he considers this operation indicated until good effects shall have been obtained from extirpation of the sympathetic.

HOOR's (405) case was one of simple glaucoma in a patient of



sixty-four. A sclerotomy in each eye had a transitory effect lasting only twenty months. Resection of the left superior cervical ganglion and of the entire right cervical portion of the sympathetic caused in the better eye an improvement in vision of from  $\frac{6}{38}$  to  $\frac{6}{18}$  and an increase of about  $5^\circ$  in the field of vision. The vision in the right eye, amounting to movements of the hands, remained unchanged. The period of observation was three months.

ROHMER (406) did sympathectomy for glaucoma in seventeen cases, in many of them on both sides. A pupil of Rohmer's in his inaugural dissertation collected all the cases in the literature in which this treatment was employed. Rohmer tabulates his results as follows:

	Number	Improvement	Transient or no Improvement	Aggravation
Glaucoma simplex . . .	43	36	5	2
Glaucoma chron. inflam. .	39	23	10	1
Glaucoma subacut. . . .	14	6	6	2
Glaucoma acutum . . . .	9	4	5	—
Glaucoma hemorrhag. . .	5	5	—	—
Hydrophthalmus . . . .	6	4	1	1

Apparently the results were best in glaucoma simplex, of which five-sixths were improved; also in chronic inflammatory and in infantile glaucoma (hydrophthalmus) the results were good, since in two-thirds of the cases improvement was obtained; on the contrary, the operation in acute and subacute glaucoma is, in accord with previous observations, of doubtful value. BERGER.

TERRIEN (408) recommends in many cases of absolute glaucoma the extirpation of the ciliary ganglion by means of Krönlein's method instead of enucleation. He states that it is not difficult to find and remove this ganglion—a statement somewhat surprising to those of us who have sought for it, often in vain, in the dead body.

The patient whose case is recorded by TAYLOR (409) was a woman who twelve years ago lost the sight of the right eye from glaucoma fulminans. Six years ago, when she was sixty-seven years of age, an acute attack came on in the left eye and all perception of light was abolished. This condition lasted for three weeks when Bell Taylor saw her. He at once did an iridectomy, and she regained sufficient sight to enable her to go about unat-



tended and to read the newspaper with moderate fluency. This condition of things still remains.

FRIEDENWALD (410) describes a case of glaucoma which presented a defect in the inferior nasal quadrant of the field of vision, extending from the periphery, in the form of a narrow tongue-like prolongation, into the blind spot. Such peculiarities in glaucoma were first pointed out by Bjerrum. ALLING.

By posterior sclerotomy WEBSTER (411) was able to relieve a patient, ninety years old, of pain due to hemorrhagic glaucoma. ALLING.

BURNETT (412) opens the anterior chamber from without by a succession of strokes with the point of a Graefe knife. After puncture the incision is completed with a blunt-pointed knife or scissors. ALLING.

#### XVIII.—SYMPATHETIC OPHTHALMIA.

413A. **Osaki.** Pathological examination of a sympathizing eye, with remarks on the development of sympathetic choroiditis. *Arch. f. Augenheilk.*, xlv., p. 126.

414. **Asayama.** Complete microscopic examination of a case of sympathetic ophthalmia. *Graefe's Archiv*, liv., 3, p. 444.

415. **Vail.** A case of sympathetic ophthalmia, with complete recovery of both eyes. *Amer. Jour. of Ophth.*, June, 1902.

OSAKI (413A) found, in an eye affected with sympathetic chorio-retinitis, peripheric round or irregular spots in the retina, at first yellow-white then becoming red, some so small as to be barely perceptible, others  $\frac{1}{8}$  p. d. in diameter. These increased in size and number during the course of the disease and finally disappeared in part.

Only a few points need be noted from the paper by ASAYAMA (414) since in general his results correspond with those usually found. In the eye secondarily affected, no bacteria were found nor any tubercle bacilli, although their presence was suspected and the patient died of tuberculosis of the lungs. The optic nerve exhibited just behind the ball inflammatory changes, but farther back and in the chiasm these were wanting. The supra-choroidal space in the posterior half of the ball was completely obliterated by new-formed spindle-celled tissue. There were no giant or epitheloid cells. In the iris were numbers of small hyaline globules, which are perhaps to be regarded as a later stage of the bodies described by Schirmer.

VAIL (415) reports the case of a boy of fourteen in which sympathetic ophthalmia developed seven weeks after a penetrating wound at the sclero-corneal margin. The second eye presented minus tension, deep anterior chamber, iris off-color, posterior synechiæ abundant, vision  $\frac{2}{80}$ , optic-nerve head slightly swollen. Under treatment both eyes cleared, and one year later vision was normal in both.

ALLING.

Sections XIX.-XXII. Reviewed by DR. v. HASELBERG,  
Berlin.

# XIX.—RETINA AND FUNCTIONAL DISTURBANCES.

416. **De Bono.** Complete acute bilateral amaurosis from alcoholic intoxication, with symmetrical ophthalmoscopic changes. *Arch. di Ottalm.*, ix., 3-4.

417. **Basso.** Bitemporal hemianopsia with pathological report in a case of acromegaly. *Ann. di Ottalm.*, xxxi., 1-2.

418. **Greeff.** On the tubular form of visual field in hysteria. *Berliner klin. Wochenschr.*, No. 21, 1902.

419. **Michel, Georg.** A contribution to the knowledge of septic retinitis. *Inaug. Dissert.*, Tübingen, 1902.

420. **Birch-Hirschfeld.** Further contributions to the pathogenesis of alcohol amblyopia. *Graefe's Archiv*, liv., 1, p. 68.

421. **Jocqs.** The prognostic value of hemianopic limitations of the visual field in tabic patients. *Ophth. Klinik*, 1902, No. 18.

422. **Grandclément.** Detachment of the retina treated with dionin. *Bull. de la soc. d. sciences méd. de Lyon*, May, 1902.

423. **Josserand.** Cortical blindness. Absence of pupillary reaction. *Ibid.*, March, 1902.

424. **Raehlmann.** On the ophthalmoscopic diagnosis of sclerotic retinal vessels. *Zeitschr. f. Augenheilk.*, June, 1902; and on endarteritis obliterans of the retinal vessels and its relation to embolism of the central artery of the retina. *Ibid.*, May, 1902.

425. **Bard.** A case of alexia of operative origin. *La semaine méd.*, No. 18, p. 196, 1902.

426. **Barrett, J. W.** Sudden temporary loss of vision, probably of circulatory origin. *Ophth. Review*, Oct., 1902.

427. **Reynolds.** Toxic amblyopia. *Amer. Jour. of Ophth.*, May, 1902.

428. **Weeks.** Ganglionic neuroma of the retina. *N. Y. Eye and Ear Infirmary Reports*, Jan., 1902.

429. **Posey.** Transient monocular blindness. *Jour. Amer. Med. Assoc.*, May 31, 1902.

430. **Zimmermann.** Two cases of hysterical monocular diplopia. *Ophth. Record*, July, 1902.

DE BONO's (416) patient was a man of forty, a heavy drinker, whose vision had been good until he drank  $\frac{1}{2}$  litre of strong spirits and woke up blind the next morning.

The lids were open, the cornea transparent, but sensibility almost wanting. Pupils 6.5mm wide and not responsive to light. Motility of the eye normal. Two days later a light could be recognized but not located. The ophthalmoscopic changes were absolutely symmetrical in the two eyes and involved chiefly the temporal segment of the disc, which was occupied by a yellowish-gray mass, which extended laterally 1 p. d., and above and below 2 p. d. over the retina, covering the vessels and appearing slightly striated in the periphery. The arteries were pale and narrow, the veins full and in places having six times the diameter of the arteries. No hemorrhages. No changes at the macula.

Treatment with derivatives and strychnine improved the condition, but the visual field remained concentrically contracted; there was a relative central scotoma. L disc normal, R pale, and white in its nasal segment. Arteries narrow. Slight perivasculitis.  $R V = \frac{1}{3}$ ,  $L V = \frac{1}{2}$ . KRAHNSTÖVER.

BASSO (417) now gives a pathological report on the optic nerves in a case of acromegaly previously reported in life. There had been typical bitemporal hemianopsia, but this was intermediate between a slight disturbance of vision and almost total blindness, affecting first the left and then the right eye. Examination could not be made of the place of apposition between the tumor of the hypophysis and the chiasm. The secondary descending degeneration was found in various stages from the degeneration and absence of the nerve fibres to the hyperplasia of the neuroglia and the septa. The most advanced degeneration was found nearest the lamina cribrosa. KRAHNSTÖVER.

GREEFF (418) reported the case of a girl with various hysterical symptoms, who exhibited the tubular form of visual field, there being equal concentric contraction at 1 and at 5m, differing from the more common funnel-shaped field.

MICHEL (419) reported a case of general sepsis, with old metastatic irido-cyclitis in one and fresh septic retinitis in the other eye. Throughout the retina and optic nerve were foci of inflammation and of hemorrhage, but no micro-organisms could be found.

BIRCH-HIRSCHFELD (420) has extended his earlier studies on the effect of methyl-alcohol on the eyes of rabbits and chickens,



now using dogs and monkeys, into the stomachs of which methyl-alcohol was repeatedly introduced by means of a stomach tube.

He found again the degeneration of the retinal ganglion cells previously described, long before any pathological changes were discoverable in the optic nerves. In one monkey the picture of optic neuritis appeared and an extensive degeneration of the nerve was found. He believes that in ethyl-alcohol amblyopia also the primary changes are in the nervous and not in the connective tissue.

JOCQS (421), from the study of three cases, calls attention to the unfavorable results of the hemianopic visual disturbances in tabic patients, which are rare, but lead to almost complete blindness as soon as the point of fixation is reached.

In a patient with high myopia and detachment of the retina, GRANDCLÉMENT (422) noticed, after the instillation of a few drops of 5 % dionin solution, chemosis, lachrymation, and pain. The next day the retina was in place again, but became redetached. This occurred several times after the use of dionin. Finally, after a subconjunctival injection of salt solution, a permanent re-attachment of the retina took place. In the discussion, Dor stated that he had observed an improvement in detachment of the retina after instillations of dionin. BERGER.

JOSSERAND (423) observed a very noteworthy case of cortical blindness. A modiste became blind suddenly while at work. Vision returned, however, so that she was able to go home alone. Then the vision gradually diminished and in two weeks the patient was completely blind. The interior of the eye was normal. There was no reaction to light. The patient died with symptoms of marked cachexia. At the autopsy the author found bilateral softening of the occipital lobe, the cuneus being involved, while the lingual and fusiform lobules were healthy. There was advanced atheromatous degeneration of the basilar and of the posterior cerebral artery.

The lack of light reaction, notwithstanding the views of Wernicke, may not exclude the existence of cortical blindness. Dejerine also fails to find in all cases of cortical hemianopsia a reaction to light, agreeing with Wernicke's theory. BERGER.

RAEHLMANN (424) presents several drawings of sclerotic retinal vessels and recommends the erect image for diagnosis. He calls attention to the great importance of such examinations as indicating the condition of the cerebral vessels.



BARD (425) reports a remarkable case of right homonymous hemianopsia which came on suddenly in a man of fifty-six. Epileptic attacks came on at the same time, although there were no evidences of increased intracranial tension, and trephining was performed by a surgeon. Nothing abnormal being found on the surface, an experimental incision was made, and this allowed the escape of a quantity of liquid, coming perhaps from a cyst. A drainage tube was introduced and an antiseptic dressing applied. The patient tore off the dressing and pulled out the tube. After the operation, the epileptic attacks reappeared, the hemianopsia remained unchanged, and there developed an alexia verbalis sed non litteralis, which apparently was due to a lesion caused by the operation or the insertion of the tube, and presumably consisted in the destruction of association fibres or in changes produced at a distance (*Fern-wirkung*).

BERGER.

BARRETT'S (426) patient was a man, aged sixty, who lay down to sleep after lunch. On awakening two hours later he found the right eye was quite blind. He repeatedly tested it, and about six P.M. he found he could see the flame of a candle. Gradually it appeared as if a curtain were lifting from before the eyes, and an hour later he could see as well as ever. When examined the next day, the only thing noticeable was that the superior nasal vein was constricted near the disc. The disc was perhaps a trifle paler than that of the other side. The point of interest was that the vision after two hours' obscuration was restored to the same as it was before the attack.

MARSHALL.

REYNOLD'S (427) contribution consists of the record of a case of nearly total blindness as the result of drinking essence of cinamon, a typical case of auto-toxæmia, and four cases of tobacco amblyopia in persons who had never taken alcohol.

ALLING.

WEEKS (428) describes a small tumor found in the nerve-fibre layer of the retina. It consisted of irregularly oval cells loosely set in stroma of nerve fibres and Müller's fibres. The cells had the appearance of ganglion nerve cells that had undergone slight degenerative changes. Ganglionic neuromas are of extremely rare occurrence.

ALLING.

POSEY (429) relates five cases which in general showed attacks of total or partial monocular blindness without other symptoms or findings. Cause is regarded as vascular and comparatively innocent.

ALLING.

## XX.—OPTIC NERVE.

431. **Schieck.** Clinical and pathological studies on the intoxication amblyopia. *Graefe's Archiv*, liv., 3, p. 458.

432. **Elschnig and Goldberg.** Histological artefacts in the optic nerves. *Klin. Monatsbl. f. Augenheilk.*, xlv., 2, p. 81.

433. **Pagenstecher.** On tumors of the optic nerves. *Graefe's Archiv*, liv., p. 300.

SCHIECK (431) had the opportunity of examining, sixteen hours after death, the optic nerve in a case of toxic amblyopia of nine weeks' duration. He found a marked increase in connective tissue and many new vessels, some of which exhibited thickening of the intima, increase in glia nuclei, and particularly of the endothelial cells and connective-tissue cells. Connective-tissue processes had grown into the nerve bundles, but there was no evidence of strangulation of the bundles of nerve fibres, only spaces into which the connective tissue had extended.

ELSCHNIG (432) showed by a series of experiments on the cadaver that the changes in the optic nerves, described by Siegrist, depend chiefly upon crushing during enucleation in life or from the cadaver, or upon the chiselling down upon the nerve so that it can be removed. If, after carefully chiselling through the roof of the orbit, one removes the optic nerve with the uninjured optic canal, and removes the bone only after hardening the specimen, the changes are not found. Elschnig believes that the changes found by Otto in arterio-sclerosis depended upon the same error.

PAGENSTECHER (433), after a review of the literature, reports three cases of tumor of the optic nerve. One was an endothelioma, the second was of doubtful nature (glioma or myxosarcoma), and the third was probably a sarcoma. Pure neuroma of the optic nerve does not seem to exist.

## XXI.—INJURIES, FOREIGN BODIES, PARASITES.

434. **Mayweg.** On magnet operations. *Klin. Monatsbl. f. Augenheilk.*, July, 1902.

435. **Cofler.** On the extraction of bits of iron from the anterior portions of the eye with a magnetized lance. *Ann. di Ottalm.*, xxxi., 1-2.

436. **Cramer, E.** A case of complete recovery from siderosis of the ball. *Klin. Monatsbl. f. Augenheilk.*, 1902.

437. **Panas.** Traumatic injury of the extrinsic muscles of the eye. *Arch. d'ophth.*, xxii., 4, p. 229.

438. **Panas.** Traumatic ruptures of the sclera. *Arch. d'ophth.*, xxii., 7, p. 422.

439. **Rosenberg.** Injuries of the eye in the Tübingen clinic between 1896 and 1900. *Inaug. Dissert.*, Tübingen, 1901.

440. **Hartmann.** Injuries of the eye in the Tübingen clinic in 1900. *Inaug. Dissert.*, Tübingen, 1901.

441. **Puccioni.** Amaurosis and amblyopia of traumatic origin. *Bull. della R. accad. med. di Roma*, xxvii., 4, 5, 6.

442. **Haab.** The removal of foreign bodies from the eye. *Journ. Amer. Med. Assoc.*, Aug. 30, 1902.

443. **Standish.** The removal of bits of steel from the interior of the eye. *Ibid.*

444. **Sweet.** Foreign bodies in the eye. *Ibid.*

445. **Chance.** The clinical and pathological report of a case of foreign body retained in the eye for twenty-six years. *Ophth. Record*, March, 1902.

MAYWEG (434) has done 92 operations with the hand and giant magnets since 1892, in addition to 158 done previously. In general he had better results with a meridional section (47 cases) than with the giant magnet and extraction from the anterior chamber after section with a lance (25 cases). In the former series, good results were obtained in 21 cases, and in the latter in but 6 cases. Enucleation was required in 9 cases.

CRAMER (436) found total siderosis of the ball in a man who was not aware of any previous injury. The sideroscope revealed the presence of iron. Extraction with the hand magnet, and ten days later removal of dust-colored lens fibres lying on the iris. Passing off of the siderosis.  $V = \frac{1}{16}$ .

In PANAS'S (437) first case, a man of thirty-two was struck on the lower lid, just above the floor of the orbit, with a piece of wood, and without any apparent injury suffered a rupture of the tendon of the superior rectus muscle, causing an annoying diplopia, which was relieved by an advancement. In the second case, the patient was struck with the horn of a cow and had, besides a wound of the lower lid, a rupture of the inferior rectus between the tendon and the belly of the muscle. Recovery after advancement. In the third case, the point of a stick entered the inner angle of the eye and symblepharon resulted. The advancement of the adherent internal rectus with tenotomy of the external rectus produced little effect.

Panas describes these infrequent injuries and studied on the cadaver and in animals the conditions under which they arise. He was never able to tear the tendon from the ball but only to rupture the belly of the muscle. He accepts the view of Maligne that in order to tear the tendon the muscle must be in a



state of contraction, and that if contraction does not exist the muscle itself is torn.

V. MITTELSTÄDT.

PANAS (438), presenting several observations, discusses the scleral ruptures arising from contrecoup after the action of a blunt force. These always ran equatorially in the thinnest portion of the sclera in the region of Schlemm's canal. When the force acts from before, there is frequently in young persons a meridional rupture of the cornea, which, continuing into the sclera, assumes an equatorial direction. A straight rupture of the cornea and sclera speaks against the action of a blunt force, which may be of medico-legal importance.

Wherever the resistance of the sclera is lessened, as in sclero-choroiditis anterior, a rupture may readily occur. The prognosis is unfavorable. There is danger also of sympathetic ophthalmia, which Panas has observed in nine cases of open, and eight cases of subconjunctival, rupture. In open wounds, scleral sutures are indicated, as they are in subconjunctival wounds, which are gaping; in cases of staphyloma, excision and suture. A lens luxated under the conjunctiva may be removed later if necessary.

After a trauma with commotio cerebri, PUCCIONI (441) observed immediate blindness of the right and amblyopia of the left eye, the latter recovering. The blow had been on the left side of the head, and the writer believes the cause to have been probably a hemorrhage from indirect fracture of the base.

KRAHNSTÖVER.

HAAB (442), in an address before the Ophthalmological Section of the fifty-third annual meeting of the American Medical Association, classifies foreign bodies found in the eye under two heads: magnetic and non-magnetic. Owing to the difficulty in extracting the latter, it is often advisable to leave these particles in the eye, since the injury produced by the operation might be greater than that from the foreign body left in its place. At times Demarres's capsule forceps are of use when the splinter is free and visible in the vitreous. Magnetic bodies are best removed with the Haab magnet. The author's technique is as follows: The patient is brought into such a position that the point of the magnet is opposite the centre of the cornea, in order that the splinter may pass directly to the lens and not be drawn into the ciliary region, from which its extraction would be difficult. When the iris begins to bulge, the current should be cut off, since under no conditions should the foreign body be drawn through



the iris. With the exercise of skill and patience the splinter may usually be drawn through the pupil. If the splinter should stick behind the iris, a small incision may sometimes be made at the periphery of the cornea and the iris torn away from its root, forming a dialysis. When in the anterior chamber, the foreign body can be extracted with the magnet through a suitably placed incision. Even foreign bodies which enter through the sclera are best removed by the method just described. Out of 165 cases of the author, the operation failed in only 23. The failures were in great part due to the fact that the splinters were too firmly imbedded or had become covered with exudate. To combat infection, he recommends the inserting of rods or tablets of iodoform-gelatine into the wound.

ALLING.

STANDISH (443) reports a series of eight cases in which bits of steel were driven through the cornea and lens and removed with a Haab magnet without making an incision in the sclera.

ALLING.

SWEET (444) has constructed a medium-sized magnet  $10\frac{3}{4}$  inches long by  $2\frac{1}{2}$  inches in diameter. The core tapers towards the end, which adds to its strength.

ALLING.

In the case of CHANCE (445), the eye had contained a foreign body for twenty-six years, and during this period there was useful vision. After recent injury, an inflammatory attack necessitated enucleation. This attack was probably rendered more severe by the presence of degeneration. The foreign body was found in the position previously demonstrated by a radiograph.

ALLING.

## XXII.—OCULAR DISTURBANCES IN GENERAL DISEASES.

446. **Widal.** The Argyll-Robertson pupil and lymphocytosis of the cerebrospinal fluid. *Soc. méd. des hôpitaux de Paris*, July 22, 1902.

447. **Dejerine.** Argyll-Robertson pupils in a patient with hypertrophic-peripheral neuritis. *Soc. de neurologie de Paris*, June 5, 1902.

448. **Jaffray and Schrameck.** The relations between irregularity of the pupil and the Argyll-Robertson pupil. *Bull. de la soc. de neurol. de Paris*, March 13, 1902.

449. **Dufour.** The relations between pupillary disturbances, syphilis, tabes, and general paresis. *Bull. de la soc. méd. des hôpitaux de Paris*, June 13, 1902.

450. **Petit.** Palpebral and conjunctival manifestations occurring in the course of intracranial affections. *Ann. d'oculistique*, cxxviii., p. 209.

451. **de Lapersonne.** Optic neuritis in diseases of the brain. *Gazette des hôpitaux*, 1902, p. 425.
452. **Pauly.** Double occipital softening, absence of the pupillary reflex. *Bull. de la soc. des sciences méd. de Lyon*, March, 1902.
453. **Chaillons.** Pupillary disturbances in patients with aortic dilatation. *Ann. d'oculistique*, cxxviii., p. 28.
454. **Ballet.** Multiple sclerosis with ocular disturbances. *Bull. de la soc. de neurol. de Paris*, May 15, 1902.
455. **Brissaud and Péchin.** Cerebral syphilis simulating general paresis. Jacksonian epilepsy. Dysarthria. Ocular paralyses. Diagnostic value of ocular symptoms. *Arch. d'opht.*, xxii., 8, p. 489.
456. **Schimamura.** Is there an endogenous toxic infection of wounds of the eye? *Klin. Monatsbl. f. Augenheilk.*, xlv., p. 273.
457. **Singer.** On disturbances of vision after hemorrhage. *Beiträge z. Augenheilk.*, 53.
458. **Purtscher.** A case of metastatic ophthalmia. *Centralbl. f. prakt. Augenheilk.*, xxvi., p. 257.
459. **Mohr.** Ocular symptoms of iodoform poisoning. *Arch. f. Augenheilk.*, xlv., p. 184.
460. **Jones, R. Llewelyn.** Contracted visual fields in rheumatoid arthritis. *Brit. Med. Jour.*, Nov. 29, 1902.

DEJERINE (447) observed in a case of peripheral hypertrophic neuritis the existence of the Argyll-Robertson symptom, which he in all the cases he has observed has attributed to syphilis. In the discussion, Jaffray combatted this idea, stating that he had observed the development of the Argyll-Robertson pupil in cases of aortic disease. Brissaud and Raymond had found unilateral Argyll-Robertson pupil in cases of tabes. BERGER.

JAFFRAY and SCHRAMECK (448) found in a number of patients with tabes or paresis that an irregular form of the pupil was to be observed earlier than the Argyll-Robertson symptom. The former symptom is therefore of great diagnostic importance.

BERGER.

DUFOUR (449) examined the pupils of eleven hundred patients, among the number being ninety-nine who had unquestionably formerly had syphilis. Inequality of the pupils does not indicate syphilis, but an irregular form of the pupil is of greater importance, while the Argyll-Robertson pupil allows one to conclude with certainty that the patient has syphilis or a parasymphilitic disease such as tabes or paresis. In the discussion, P. Marie stated that he regarded the Argyll-Robertson pupil as an evidence of the existence of a lesion in the posterior columns of the cord, which may be of non-symphilitic nature. BERGER.

PETIT (450) observed a case of brain syphilis in which, besides a right homonymous hemianopia and right hemiplegia, a neuralgia of the right fifth nerve developed and later a neuralgia of the left. Petit considers noteworthy the sudden appearance of oedema of the lids and chemosis of the right side which the other symptoms followed. All the symptoms except the hemianopia disappeared after energetic treatment by inunctions of mercury. No similar case has been reported, but Salemi has noticed hyperæmia of the conjunctiva in the insane during the period of agitation, and Morax observed an inflammation of the conjunctiva in an epileptic during the attacks.

BERGER.

DE LAPERSONNE (451) observed in a girl of twenty-two, with increased frequency of the pulse and increased arterial tension, without any determinable disease of the heart, a bilateral hydrophthalmus, which with pain led to blindness in the right eye and a diminution of vision to one half in the left. An iridectomy on the right (blind) eye had only a transient effect. But after removal of the superior cervical ganglion on each side the right eye became free from pain, and the tension fell to normal in both eyes, while the tachycardia and abnormal arterial tension were greatly relieved.

The writer calls attention to the combination of circulatory disturbances and hydrophthalmus which perhaps exists oftener than is supposed. The case reported seems to support the view of Gallenga and Angelucci, who regard a congenital dilatation of the vessels with increased excretion of liquid as the cause of hydrophthalmus.

V. MITTELSTÄDT.

PAULY (452) observed in a man of seventy-six bilateral blindness with a normal interior of the eyes and absence of pupillary reaction to light. At the autopsy, foci of softening were found in both occipital lobes, while the optic nerves and corpora quadrigemina were entirely normal. In the debate, Jaboulay stated that he believed that when cortical lesions existed, particularly when they were bilateral, functional disturbances in the mesencephalic nerve nuclei might develop as distant symptoms, and in this way he would explain Pauly's case.

BERGER.

CHAILLONS (453) believes that the generally accepted idea of the inequality of the pupils in aortic aneurysm is not proven. Among seventy-four cases demonstrated before the Paris Anatomical Society, inequality of the pupils was noticed only five times. From two observations of his own (right ophthalmoplegia



interna and dilatation of the aorta, myosis and the Argyll-Robertson symptom with aortic aneurysm), the writer concludes that in all cases of aortic aneurysm with pupillary disturbances both are to be regarded as symptoms of syphilis. BERGER.

BALLET (454) observed as initial symptoms in a case of multiple sclerosis, uniocular polyopia, and paralysis of associated movements to the left; five years later, diplopia came on, and one year later, disturbances of speech. Fifteen years after the beginning of the disease, the paralysis of associated movements toward the right still existed and there was paralysis of convergence.

BERGER.

The interesting case reported by BRISSAUD and PÉCHIN (455) was in a man of forty-two, who had been treated for syphilis twenty-one years before and now presented symptoms of progressive paralysis, which began with scintillating scotoma, headache, and attacks of Jacksonian epilepsy. The last became frequent and finally the right arm was paralyzed. After some intramuscular injections of an oily solution of biniodide of mercury, the symptoms cleared up completely. Then there developed on the right side complete paralysis of the abducens, incomplete of the facial, as well as ptosis and partial ophthalmoplegia interna, which were referred to endarteritis at the base, and thus spoke against the diagnosis of progressive paralysis. There was complete and permanent recovery and the patient was able to resume his work. V. MITTELSTÄDT.

SCHIMAMURA (456), working under Axenfeld's direction, was unable to produce reaction in an ocular wound by injecting filtrates of *Bact. coli comm.*, *Bact. pyocyan.*, and *Staphyl. aureus* beneath the skin, into the veins, or into the peritoneal cavity. Contrary results must be explained by ectogenous infection.

SINGER (457) collected one hundred and ninety-eight cases of visual disturbance after hemorrhage and grouped them according to age, sex, time of onset, recovery or improvement, etc. Visual disturbances are most frequent after hemorrhage from the stomach—40.2%, and next in frequency after uterine hemorrhage—32.8%. The amount of blood lost is not of great importance; small hemorrhages may cause serious visual defects. Most frequently the disturbance comes on from three to ten days after the hemorrhage; in 87.6% both eyes are affected; the visual field shows all possible changes, but chiefly peripheric contraction, hemianopia,



and central scotoma. Ophthalmoscopically there is often found optic neuritis at first and atrophy later.

PURTSCHER (458) describes a metastatic ophthalmia with orbital abscess in a case of pneumonia of the upper lobes. The pneumococcus was found almost in pure culture in the vitreous. He explains the simultaneous appearance of pus in the orbit and in the ball as being due to a double infection.

MOHR (459), after a general description of all the symptoms of iodoform poisoning, reports a case in a boy of thirteen, who received in ten weeks 230 g. of 10 % iodoformol by injection for a tuberculous coxitis. In the eleventh week, there came on suddenly vertigo, papillitis, paralysis of the abducens, contraction of the visual field. The ultimate vision was  $\frac{5}{7}$ . In a second case, a similar condition followed the administration of the same amount of the drug. There was no central scotoma.

JONES (460) has for the last year been investigating the visual fields in cases of rheumatoid arthritis, complicated with Raynaud's disease. The fields of fifty such cases were taken and all showed some—though a variable—amount of contraction. After the inhalation of nitrite of amyl, they all increased, but in none did they reach the normal; the remote periphery seemingly has undergone structural changes as a consequence of oft-recurring periods of blood famine.

MARSHALL.

## BOOK REVIEWS.

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**VII.—The Practical Details of Cataract Extraction.** By H. HERBERT, F.R.C.S., Eng. Major I.M.S., Professor of Ophthalmic Medicine and Surgery, Grant Med. College ; in charge of the Sir Cowasjee Jehangir Ophthalmic Hospital, Bombay ; 109 small 8vo pages. London : Baillière, Tindall & Cox, 1903.

The author begins his preface with the following words : " This account of cataract extraction and of matters bearing upon it differs from others in that it is largely made up of a mass of practical detail, ordinarily omitted, and it includes a certain amount of original observation throughout. I have attempted to record what I have learnt from the performance of between 2000 and 3000 operations, and from teaching, both in the lecture theatre and in hospital, since 1895."

An account of so many operations done and reported by one man cannot but be very instructive, especially if, as it is here the case, the author is a well-informed oculist and a clear writer. The reviewer has read the book attentively from one end to the other and would fain give an extensive analysis of it if the limit of a notice permitted. He can only say that the nicely gotten up and unpretentious little volume must prove so highly valuable to every operating ophthalmologist that he will wish to read it himself.

The results of cataract operations depend so much on a multitude of nice details not usually found in even the larger text-books, that we all may be thankful to the author for giving us access to the sources of his experience. He is one of those teachers that after the description of the phenomenon, feel impelled to inquire into its causes. Some of his arguments invite discussion, though all

appear plausible. The first chapter (fifteen pages), under the title "Operable Cataract," treats of the varieties of cataract, their stages of maturity, and indications for treatment. In tabular form he presents the volume of cataractous lenses at different ages, obtained with the aid of Priestley-Smith's lens-measurer. Chapter II. — description of the operation — begins with these words: "The path of success in this, the capital operation in eye surgery, is so beset with pitfalls and hedged in with difficulties and dangers, that even the experienced surgeon can scarcely hope to maintain throughout quite 100 per cent. of good results in uncomplicated cataracts only." He details the preparation of the patient (asepsis, etc.); the preliminaries; the instruments, their quality, how to test and preserve their sharpness (he uses a good deal an irrigator according to McKeown); the initial steps; cocaine ten minutes, the patient lying on a suitable table or bed, or reclining on an operating chair. His preference is the combined upward extraction, with a small central conjunctival flap, opening the capsule by *one vertical* incision with a cystotome (which is open to criticism), expulsion of the lens, its difficulties and accidents (especially prolapse of vitreous), the toilet of the eye, the dressing and after-treatment. Chapter III: Discussion of the operative technique, and the alternative procedures. He has made a considerable number of simple extractions, and though he does not favor it he sums up: "Thus, the question, essentially one of compromise, is gradually working itself out in the selection of management of cases." With this sentence all operators, *familiar* with both methods, will agree: it is a question of indications, with a variable personal oscillation where the balance-sheet will be on the side of the experience of the operator.

After describing and criticising the tearing off the centre of the anterior capsule he says (p. 63): "In direct contrast to the tearing away of the anterior capsule is Knapp's and Gayet's *peripheral incision* in the upper part of the capsule, parallel with the corneal section, designed to keep lenticular *débris* enclosed, away from contact with the iris. The much greater frequency of after-cataract requiring treatment condemns this practice." There is a misunderstanding on the part of the author: the horizontal incision in the upper part of the capsule is not designed to keep away from the iris lenticular *débris*, but to prevent the contact of the raw edges of the shreds of capsule with the fine lacerations of the sphincter-edge of the iris caused by the passage of the cataract

through the pupil, this contact producing the synechiæ between iris and capsule through agglutination of raw surfaces. The reviewer, at this place, desires only to assure the author that the peripheral incision admits of as easy and thorough evacuation of the capsular sac as any other opening of the capsule.

Very interesting is the author's following citation: "CAPTAIN SMITH, I.M.S., with his 1651 extractions *within the capsule*, at Jullundur in the Punjab, with only 8.2 % of vitreous escape. He is the chief latter-day exponent of this operation [usually associated with the name of Pagenstecher, in Europe], which has long found favor in that province, remarkable in providing for a few surgeons an experience in cataract work far greater than is to be got anywhere else in the world.

Chapter IV.—"the after-complications" treats in detail of the infective processes, irido-cyclitis, non-infective iritis, prolapse and incarceration of the iris, expulsive retro-choroidal hemorrhage, after-cataract, secondary glaucoma, detachment of the retina, transient detachment of the choroid (Fuchs, p. 92), concluding with statistics of indifferent and bad results. Complicated and soft cataracts, extraction in high myopia (one page, 101), dislocated lenses, the extraction of soft cataract, and an index conclude this very instructive monograph. H. K.

VIII.—**A Manual of Diseases of the Eye, for Students and General Practitioners.** By CLARENCE A. VEAZEY, A. M., M. D. 12mo, 410 pages, with 194 engravings and 10 colored plates. Lea Brothers & Co., Philadelphia and New York. \$3.50.

This book is judiciously prepared, carefully written, and conveniently gotten up. Though following the usual arrangement of the galaxy of "text-books of Diseases of the Eye for Students and General Practitioners," the subject-matter is admirably selected and adapted to the class of readers to which it appeals. They will find in it all that the most rigorous examiner could ask, and later, when they are in practice and want to read up on an eye case, their text-book can scarcely fail to impart to them all the information needed.

The bulk of the treatise is devoted to the organic diseases of the eye, as it ought to be. He gives only 42 of the 410 pages to the normal and abnormal refraction and accommodation, and he does the subject justice. Important as this department is for the ophthalmic specialist, we cannot demand from a general



practitioner to determine how far the cerebral symptoms and manifold functional distress of a patient that has a degraded constitution and leads an unwholesome life depend on errors of refraction. As far as the eyes are concerned, he should be able to recognize their external and internal organic diseases as well as their functional anomalies, including refraction and motility; but intricate problems of the latter he may fairly be allowed to refer to the specialist.

We said the book was conveniently gotten up. We mean that the publishers took care to help the student in reading and understanding it. The text is legible; the heavy-face at each paragraph indicates the subject-matter conspicuously, makes rehearsals easy, and aids memory; the profusion of plates (nearly all of which, however, are borrowed), act in the same way.

The book can be heartily recommended.

H. K.

**IX.—The Refraction and Motility of the Eye, for Students and Practitioners.** By WILLIAM NORWOOD SUTER, M.D., Assistant Surgeon Episcopal Eye, Ear, and Throat Hospital, Washington, D. C. 12mo, 390 pages, illustrated. Lea Brothers & Co., Philadelphia. \$2.00.

This book goes over the physical part of ophthalmology, that which commonly offers the beginner a great deal of difficulty, and therefore it may appropriately be set apart for particular study. A certain amount of elementary geometry and algebra is necessary to understand its contents as well as to solve the problems encountered daily in ophthalmic practice. The book, if patiently and thoughtfully gone through, will lay a solid foundation to unravel the complicated and frequently occult conditions presented by the numerous cases of refractive and motor anomalies of the eye. Even when the student has overcome these difficulties, he will have to go through a prolonged drill to make himself familiar with the many optical apparatus and other means of diagnosis, besides acquiring the requisite dexterity in operating. Without an extensive stock of theoretical knowledge, nobody could be proficient in treating the diseases of refraction and motility. To acquire that knowledge, Dr. Suter's book can be heartily recommended. It is well written, tolerably up-to-date, and sufficiently complete for the ophthalmic practitioner.

We may be permitted to point out one inaccuracy. Page 196, in indicating the axis of a cylinder-lens after the ordinary method,

he illustrates, Fig. 59, the method which is very popular in Europe and considerably used in this country—viz., to count the meridians from the upper end of the vertical meridian of each eye and designate the degrees as nasal and temporal down to  $90^\circ$ . He calls this "Bisymmetrical method." There is a symmetrical method, but no bisymmetrical. Symmetry is a term of stereometry, and means that a body can be bisected by a plane in such a way that one-half represents in all its points exactly the reflex image of the other. The eyeball cannot be split in such a way by any plane. The figure used by the author has symmetrically placed *numbers*, but they indicate meridians which are by no means equal in their curvature. If, for instance,  $45^\circ$  nasal indicates the meridian of strongest curvature, the meridian  $45^\circ$  temporal is the one with the weakest curvature. The author adds: "The diagram is for the left eye; the notation is reversed for the right." This is not so. The notation is the same for both eyes; the nose is always on the medial side of the body, the temple on the lateral. All we have to do is to put an R under the *right* eye, and an L under the *left*. Moreover, it is indifferent if we look at the glass from in front or from behind.

There is in and outside of literature a good deal of confusion on the subject of symmetry. Our visual apparatus is a dual organ. If you put a mirror between the two halves of it, the one is rigorously the reflex image of the other—cast by the median plane of the *body*—in their whole extent, the brain included. With regard to the meridians of the eyes, they are as nearly symmetrical (about  $80\%$ ) as the two nostrils, or, better still, the two hands. The identical meridians are symmetrically placed (inclined) to the median plane of the body, but not to any plane of the eyeball.

H. K.

**X.—Squint: Its Causes, Pathology, and Treatment.** By CLAUD WORTH, F.R.C.S. John Hale, Sons, & Danielson, London. 12mo, 129 pp., illustrated. 6 s. net.

The monograph of Mr. Cl. Worth is written in the form of a text-book, containing a good deal that is generally known, but the greater part is original, based on a very large personal experience, which serves him in the discussion of the statements of other authors and time-honored opinions, as well as in supporting the validity of his arguments and the preference of his new methods of treatment. That squint is not a disease but only a

symptom, which he puts forcibly forward as being the statement of "most text-books," has been taught for at least five decades. In 1528 cases of convergent strabismus he has found the abduction of each eye perfect in 81 %. Among his practice he had a great many infants and very young children. The defect of abduction was less uncommon the longer the deviation had existed. He goes very carefully through all the symptoms and phases of squint. We can select only a few examples to show how he handles his subject. (P. 36.) "When the macula [by disuse] has ceased to be the most sensitive part of the retina, the eye then wanders, without remaining steadily in any definite position (*lost fixation*); or it may fix with some part of the paracentral region, or with a point of the extreme periphery (*false fixation*). . . . If an eye with *false macula* be put straight by operation, crossed diplopia is produced. If with a false macula central fixation is preserved and the fixing eye is covered, *monocular diplopia* is the result. This condition is exceedingly rare. In my detailed notes of more than 2000 cases of squint of all kinds, I found this anomaly only four times." He asserts (p. 39) that "there is rarely some congenital amblyopia," for he can prevent it with his "amblyoscope," an instrument with which the preponderance of the macula lutea can be preserved, if it is used soon after the beginning of the deviation. When this treatment was delayed, the amblyopia increased with the duration of the squint. Hyperopia is one of the causes of squint, of which the principal one is a partial or total absence of the fusion-sense (fusion-faculty—desire to binocular vision, p. 57). His method of investigating squint is fully detailed in Chapter VI., p. 80, etc. The acuteness of sight he determines by letting small children run after ivory balls of different sizes ( $\frac{1}{2}$ "– $1\frac{1}{2}$ ") thrown on the floor. The fusion-faculty he examines, almost always with his amblyoscope, a stereoscopic instrument through which slides can be seen under distances different from one another. The results are excellent when the treatment is begun very early; the best age for fusion training is between three and five years. After six years it is seldom worth while to attempt fusion training at all. A disastrous practice is to atropinize both eyes. The straight eye ought to be atropinized, but not the deviating one, which should use and develop its sight both for near and far. When prevented through atropine, the function of the macula will deteriorate.



The treatment, non-operative and operative, is described very explicitly, with tables and many case-histories to illustrate the methods of operating and their results. The wearing of glasses from earliest youth, tenotomy or advancement alone, or both combined, the minutiae of the procedures, especially his method of advancement, are depicted and explained with the greatest accuracy.

Very interesting and judicious is his description of heterophoria: eso-, exo-, hyper-, and cyclophoria. For determining their degree he uses Maddox rods and prisms. As the author here and there uses unusual words, the reviewer begs leave to make a few suggestions: for plus- and minus-cyclophoria, he would say nasal and temporal cyclophoria; for adversion and abversion, inversion and eversion [the *e* before a consonant, ex = out].

In conclusion we would like to express our opinion that Mr. Worth's treatise is original, full of ideas, and rich in useful diagnostic and therapeutic points. We think that every ophthalmic surgeon ought to read it.

H. K.

**XI.—The Ocular Circulation.** By J. HERBERT PARSONS, B.Sc., B.Sc., F.R.C.S. (1903), Curator, Royal London Ophthalmic Hospital. John Hale, Sons, & Danielson, London. 12mo, 76 pages, illustrated, 3 s.

This brochure is the publication of a recent course of lectures. The first part treats *on the circulation of the eye*, beginning with the *lower mammals*, as all experimentation must be made on these, and then he takes up man. It is essential to determine the differences which obtain. The rabbit and the dog are particularly dwelt upon. The blood-supply is illustrated by numerous outline drawings, pointing out the vascular connections of the brain and the orbit, then the intraocular circulation, those of man, of course, receiving the greatest attention. The anatomy at the end of the optic nerve is illustrated and described according to Leber, and is very instructive. The intraocular circulation is presented by very fine drawings of the pecten of birds, the dog's retina injected in low and in higher power, showing perivascular spaces, particularly the arterial, being devoid of capillaries, from preparations by Hendersen. The uveal circulation is interestingly described and copiously illustrated.

The second part treats of the *physiology of the ocular circulation*: the blood-pressure in arteries, veins, and capillaries in the eye,



compared with that of the orbit and the cranial cavity; the intra-ocular and intracranial pressure — the skull being an hermetically sealed box; the secretions, the liquor cerebri being a small quantity, just enough to serve as a lubricant. Then follow elaborate expositions on the influence of vasomotor nerves, with numerous pulse tracings, all based on delicate and varied experiments.

The third part considers the *relations of the intraocular to the intracranial circulation*, — the causes and effects of increased pressure in either, separately and both together.

The fourth part deals with: (a) *Some physiological and pathological anomalies of the ocular circulation*. Arterial and venous pulsation are well known; the normal pulsation of arteries is damped by the humors of the globe and transmitted to the contents of the globe and the plastic sclerotic, with the effect that the increase of the arteries becomes too small to be observed by ordinary ophthalmoscopic magnification. Capillary pulse is seen only in aortic regurgitation as a systolic reddening and a diastolic paling of the disc. (b) *Embolism of the retinal arteries*. (c) *Section of the central retinal vessels*. (d) *Glaucoma*. (e) *Toxic amblyopias*. With regard to the last the author says: "I have elsewhere (*Brit. Med. Jour.*, June 8, 1901) advanced the view that tobacco amblyopia is the result of two chief factors, viz.: (1) a toxic effect on the nerve cells, leading to paralysis of some of the retinal elements; (2) a vascular effect, causing vaso-constriction of the retinal arterioles. The effect of nicotine upon nerve cells is first excitatory, and secondly paralytic."

The contents of this brochure are principally anatomical, physiological, and pathological researches, based chiefly on dissection and experiment. They appeal particularly to the ophthalmologist of scientific training and analytical disposition, but also the ophthalmic surgeon will derive a good deal of benefit from Mr. Parsons's monograph.

H. K.

**XII.—Klinischer Leitfaden der Augenheilkunde.** Von Dr. JULIUS V. MICHEL, Professor der Augenheilkunde in Berlin. Dritte umgearbeitete Auflage. J. F. Bergmann, Wiesbaden. 16mo, 480 pages.

This little volume, in small but clear and legible type, is a marvel of completeness and condensation. Its title—*Clinical Guide*—means that it contains everything that may occur in the largest eye hospital or in the practice of the most popular oculist, and that it will be found described in terse language. It is a book for refer-

ence as well as for elementary study. The division of larger and smaller type distinguishes the fundamental from the higher knowledge, whereas the heavy type indicates the classification of the material, and the spaced type sets off the words and sentences upon which the author lays particular stress. An unusually detailed alphabetical, double-columned index of subjects stamps the volume as an unfailing work of reference. If, in conclusion, we state that this third edition has brought the *Clinical Guide* up to date—proof, the adoption of a partial crossing of the optic nerves (p. 297),—we can assert that the author has produced a text-book unexcelled in its kind, and manifested himself as the worthy official successor of A. von Graefe and C. Schweigger.

H. K.

**XIII.—Entre Aveugles.** Conseils à l'usage des personnes qui viennent de perdre la vue. Par le Dr. ÉMILE JAVAL, Directeur Honoraire du Laboratoire d'Ophtalmologie de l'École des Hautes Études, Membre de l'Académie de Médecine. 16mo, 208 pages. Price, frs. 2.50. Masson & Co., 120 Boul. Saint-Germain, Paris.

Dr. E. Javal, the famous ophthalmic scientist, who, together with Dr. Schioetz, has modified Helmholtz's ophthalmometer in such a manner that it has found its way from the laboratory into the examination-room of every eye hospital and every ophthalmic practitioner, if not in every country, certainly in America, suffered many years from glaucoma, which blinded one eye more than ten years ago, and the other three years ago, in spite of the care of most competent oculists. His blindness (in his sixty-second year) was neither sudden nor unforeseen by his attendants and himself. His exceedingly active mind before and immediately after the advent of this calamity, resignedly set to work to use the remainder of his faculties to the best advantage for himself and others. The little book before us is the report of his endeavors and their astonishing results. He at once concluded to continue his active life, aided by the eyes of other people, using his other senses and his mental and economical resources. He describes how a blind man can keep himself independent, attentive, and safe in the house and on the street, useful in many ways, clean, healthy, and with good manners, even at the dinner-table, provided the maid be taught to put the plates and other things before him in the right places. He can attend to his watches and clocks, walk with a cane in the city and in the country, ride a bicycle tandem—his portrait, riding on such a vehicle with a

companion, is used as a frontispiece of the book,—and undertake long journeys. Of all these achievements he cites remarkable examples. To be read to is one of the greatest resources of the blind, but how inferior to personal reading! He appreciates the satisfaction a blind person feels in the preservation of his handwriting. He describes and illustrates (p. 88) one of the writing machines for the blind which he presented to the "Académie de Médecine" April 3, 1901. He favorably mentions the fountain pen, an American invention. He advises young blind persons to learn typewriting. He writes that in many American mercantile houses the principal dictates at the phonograph to his clerk, who afterward brings him the typewritten copy. "Nothing prevents a business man or an author who has become blind from using the phonograph in this way." He says he gladly avails himself of the phonograph. "It seems that the gramophone, quite a new invention, is much superior to the phonograph."

The remainder of the book treats of the alphabet and the reading of the blind, embossed letter-signs, system Braille; marriage, memory and mnemotechnique, and psychology of the blind; music, games, and the use of tabac for the blind; and the sixth sense, "the sense of obstacles," of the blind. The author cites many published examples of the existence of such a sense, but he speaks of it with great reserve. He has no personal evidence of it in his own case.

The book is interesting, gives many suggestions and rules to oculists, how they should treat and comfort people that are blind or getting blind.

H. K.

XIV.—**Golden Rules of Refraction.** By ERNESTE MADDOX, M.D., F.R.C.S., Ed. Bristol: John Wright & Co. Small pocket size, 87 pages. Price, 1 s.

This little book is one (No. XII.) of the Golden-Rule Series. The distinguished author, to whom we are indebted for a number of valuable investigations and useful devices in refraction and motility, prefaces his booklet as follows: "This tiny volume, composed at the request of the publishers of the Golden-Rule Series, is intended chiefly for the help of general practitioners who may be commencing the study of refraction. It supposes little knowledge of optics; its calculations are of the simplest kind, and it may be regarded as a miniature of a subject to which only a large volume could do justice. It is suggested as a good plan for a beginner that he should test his tools somewhat criti-



cally, for which rules are given, that he may become interested in them and form their acquaintance before use." This reads quite well, but the so-often-appealed-to general practitioner that touches refraction is a rare bird; on the other hand, we are of opinion that the little volume is of very great value to another class of medical men, the ophthalmic surgeon who has not only resolved his didactic and hospital courses in refraction and motility, but has tried his wings in the *practice* of this department. To him the terse description of the multitude of fine details, not found so completely even in the "large volume," will be of inestimable value. He will find here all he needs, and we know nobody that could instruct and guide him better than the author. Besides the younger oculists, the older ones also will read the little volume of condensed wisdom and experience with interest and profit.

H. K.

**XV.—Eye Symptoms as Aid in Diagnosis.** By EDW. MARGENNIS, M.D., D.P.H. Bristol: John Wright & Co., 1903.

This little, well-printed, 16mo volume of 84 pages text, 12 of "Some Ophthalmic Terms and Their Meanings," and an alphabetical index of 12 pages, is designed to inform, with little loss of time, the very busy practitioner, in particular the "hard-worked, ill-requited body—the Irish Poor-Law Medical Officers,"—of the significance and importance on prognosis and treatment of eye symptoms that may occur in their practice. The object of the book is legitimate, opportune, and serves a good purpose. The vocabulary and detailed index enable the practitioner to find readily what he wants.

H. K.

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#### ANNOUNCEMENTS.

We have received the first (July, 1903) number of a new ophthalmic journal, *The Ophthalmoscope*, a monthly review of current ophthalmology. Editor, Sydney Stephenson (London); sub-editor, C. Devereux Marshall (London); correspondents: Major H. Herbert (East Indies), Dr. Charles A. Oliver (U. S.), Dr. A. Darier (France), and others. Annual subscription, 10/6. London: Geo. Pulman & Sons, 24-26 Thayer St., W.

The *next International Ophthalmological Congress* will be held at Lucerne, Switzerland, on September 19, 20, and 21, 1904. Circulars of invitation will soon be sent out.















# ARCHIVES OF OPHTHALMOLOGY.

## ON GLAUCOMA.

BY PROF. K. R. WAHLFORS, HELSINGFORS.

Abridged Translation from Vol. XLVII., 1, of German Edition, March, 1903,  
by Dr. WARD A. HOLDEN.

THE question as to the cause of glaucoma has interested ophthalmologists for half a century and has been the subject of zealous study and numerous investigations. An incredible amount of labor, diligence, and intelligence has been devoted to the solution of this question, and still to-day we have not yet learned in what the essence of glaucoma consists.

While the symptomatology of glaucoma has been studied in a most exhaustive way, and thereby many points brought out of value in respect to the doctrine of glaucoma, the pathological investigation of this affection has left much to be desired. The latter fact is due in part to the relatively small amount of available material and in part to the last stages of the disease in the eyes that are examined, when it is no longer possible to say which changes are primary and which have developed in the slow course of the disease. When we add that many authors have tried to reconcile the pathological conditions found with some preconceived idea of the nature of glaucoma, it is evident that many of these pathological investigations have little value. This is particularly true of many investigations of an early period. In recent times the scope of the investigations has been broader, and equal attention has been paid to all parts of the eye, whereby our knowledge of the pathology of glaucoma has been greatly extended.

Physiological experiments also have been undertaken in

great number without leading to a definite conclusion, although important facts with reference to the circulation of liquids in the eye have been discovered.

If we now ask why it is that, notwithstanding the expenditure of so much labor upon the study of the nature of glaucoma, we have to-day so little definite knowledge of the true character of the affection, it may be explained as being due to the fact that we have started with a false conception, since we have wished to find the essence of glaucoma in the increased tension, and since we have hoped that with the discovery of the cause of the increased tension we would at the same time discover the actual causes of glaucoma.

This conception of the importance of increased tension goes back to v. Graefe, who expressed his position in the matter in the following words: "The semiotic conception of glaucoma rests upon the increase in intraocular tension with its effect upon the functions of the optic nerve or retina."

This conception runs through all the modern theories of glaucoma like a red thread; wherever the cause may be sought, whether in the narrowing of Fontana's spaces, or in an inflammation of the choroid, or in a morbid process in the optic nerve, it is always the effects of the cause of the disease upon the lymph circulation of the eye and the resultant increased tension which are the actual chief factors.

This course of thought is justified when we are dealing with the so-called inflammatory glaucoma which begins with a marked increase in tension; in simple glaucoma, on the contrary, particularly in those in which there is little or no increase in tension, it is not justified. And yet it seems that all authors, with but a few exceptions, such, for example, as Mauthner, have considered chiefly the increased tension and have derived all the other symptoms from it, without devoting the requisite attention to simple glaucoma in which this course of thought is not justified.

It may be proper here to discuss the relation of simple to inflammatory glaucoma since in the course of time different views have been held, and indeed in recent times the view has been held by Schweigger, de Wecker, Knies, and others,

that simple glaucoma differs from inflammatory glaucoma and is to be regarded as a separate disease. It is well known that v. Graefe in his first publication expressed the opinion that simple glaucoma did not belong in the same class with true glaucoma, but that it was to be regarded as an affection of the optic nerve with excavation; this view, however, he gave up later. The more the cases were collected and the knowledge of glaucoma increased, the more the opinion grew that simple glaucoma belonged in the same category with true glaucoma, and that the cause of the disease was the same in the two. And in fact we see these two forms of glaucoma that are so different in their clinical appearance change their form and pass from one variety to the other. We see how an acute inflammatory glaucoma may lose its inflammatory character and assume the aspect of a simple glaucoma, and on the other hand we see a simple glaucoma suddenly become inflammatory. This is the case not only with simple glaucoma having increased tension, but also of the forms in which there is no increase in tension. It is particularly this latter form that one has wished to cast out of the category of glaucoma, although in its entire clinical course it resembles simple glaucoma and presents every sign of it except increased tension. Thus persons have wished to make glaucoma and increased tension identical, and deny that glaucoma existed without increased tension. Every unprejudiced ophthalmologist must concede, however, that this conception is false. I need not give statistics of such cases here for they are not rare; but I shall cite one case that I observed almost daily some years ago, and I am convinced that every experienced ophthalmologist will recall one or more cases of this sort in his practice.

An old man, a high ecclesiastic, visited me in the autumn of 1889 with the complaint that his vision had diminished recently and that in particular he was bothered by a "cloud" which lay over the lower part of the field of vision; he had also for some time had difficulty in going about at dusk or when the light was bad. There was no pain and no other complaint. On examination I found  $V = \frac{5}{6}$ ; field of vision normal except for a defect in the lower part that extended upward nearly to the



point of fixation. The light sense was reduced (4.5mm by Förster's photometer). Tension normal. Fundus normal. A diagnosis of glaucoma simplex in each eye was made. An iridectomy was done in each, and strychnia was injected. Nevertheless the diminution of vision went on steadily but slowly; the field became more and more contracted; and the optic nerve became atrophic and excavated. In this manner the disease progressed for years and ended in complete blindness and marked excavation of the disc without there being ever a trace of increased tension. Neither I nor the patient who followed the changes in his eyes with painful attention could ever discover any increase in tension. A few days before his death an attack of typical inflammatory glaucoma appeared in the right eye and soon after in the left.

There can be no doubt that in this case the cause of the disease, of four years' activity, was of a glaucomatous nature, although it produced merely diminution of vision and atrophy and excavation of the nerve; and only a few days before death was their increase in tension accompanied by the characteristic circulatory disturbances of inflammatory glaucoma.

The increase in tension is thus only something accidental—a result of the glaucomatous process, just as the functional disturbance and the excavation are results of this process; it cannot be regarded as an essential element and much less as the cause of the glaucoma. The cause is therefore the same in simple glaucoma as in inflammatory, the difference being that in simple glaucoma the nervous elements of the eye are chiefly affected and early functional disturbances result, while in inflammatory glaucoma the cause acts upon the circulation in a disturbing way and brings about increased tension besides other results. *Hence increased tension and glaucoma are not identical.*

I am not the first to express this idea, indeed it is generally known; yet it seems to be forgotten or overlooked whenever a new theory of glaucoma is constructed.

A second point of fundamental importance for the doctrine of glaucoma is that simple and inflammatory glaucoma are really one and the same disease and that the same morbid process is active in both cases. With whatever symptoms

glaucoma may begin, whether with the most severe objective and subjective signs or without evident objective disturbances and with such slight subjective annoyances that the patient scarcely takes note of them, it is still one and the same disease which appears with varying symptoms that frequently characterize only different stages of the same morbid process.

Let us see now how these fundamental ideas accord with the theories of glaucoma held at present. It is not my intention to present and discuss all the theories that have been advanced, but I shall limit myself mostly to the modern theory of retention which has been so popular in the last twenty-five years.

Common to all the retention theories is the supposition that the cause of the glaucoma lies in an interference with the outflow of liquids from the eye either in a blocking of Fontana's spaces (Knies, Weber, and others), or in a blocking of the channels at the posterior pole of the eye (Stilling), or in both these factors combined (Laqueur). When the channels of exit are blocked, the liquid accumulates, the tension rises, and glaucoma appears. The increased tension is the cause of all the disturbances in the eye which characterize inflammatory glaucoma. The marked disturbance in circulation (the inflammation?), the shallow anterior chamber, the diminished vision, the excavation of the nerve head, etc.—all are but the results of the increased tension.

In regard to the closure of the channels of exit, and particularly of Fontana's spaces, various opinions have been held. Knies (*Arch. f. Augenh.*, vii.), on the ground of pathological investigations, assumed that an *indurating inflammation* at the sclero-corneal margin was the primary trouble, and that this led to a blocking of Fontana's spaces, as well as an adhesion between the root of the iris and the cornea. But although pathological examination usually revealed such an adhesion at the root of the iris, it was not correct to regard this adhesion as the cause of the glaucoma, since probably, on the contrary, it is to be regarded as a result of the glaucomatous process. It should be remarked that these investigations were in old cases in which for one reason or

another enucleation had been done. In the few cases in which by chance an eye with fresh glaucoma has been examined (*e. g.*, Birnbacher, "Ein Beitrag zur Anatomie des Glaucoma acut.," Gratz, 1890), this adhesion was wanting. And from a clinical point of view we must acknowledge that an inflammatory process of the sclero-corneal junction as a cause of acute glaucoma has never been observed. In the numberless cases of acute glaucoma that I have seen develop, as I may say, under my eyes, there was never any evidence of such an inflammatory process. On the contrary, the attack has appeared like lightning from a clear sky in an eye until then apparently healthy. The Knies supposition of an inflammatory process at the sclero-corneal junction as the preceding cause of glaucoma seems therefore more than doubtful. The cellular infiltration which Knies, Birnbacher, and others have found in Fontana's spaces, and in the tissues about Schlemm's canal, need not be regarded as the expression of an inflammation. The excessive pigment which is frequently found in this region and doubtless comes from the uvea, indicates that these cells and this pigment have been carried here by the currents of liquid and from some cause have been deposited in the narrow canal and block it. I shall return to this point later.

Weber, indeed, does not consider an inflammatory process to be the cause of the blocking, but he believes the blocking to be due to a venous stasis in the ciliary body which swells and presses the iris against the cornea. But whether the blocking of the channels of exit depends upon an inflammatory process or upon a narrowing of the channel, the cause of the increased tension and of the glaucoma is, according to the theory of retention, the prevention of the free outflow of liquids.

This theory may be applicable in cases of inflammatory glaucoma in which, as I shall show, retention in fact plays an important rôle, but it is not applicable in cases of simple glaucoma. Here the increased tension plays a subordinate rôle. It often exists, sometimes in high degree, but as a rule in simple glaucoma the tension is not greatly increased, and in many cases there may be no increase at all. The



latter cases are of the more importance in the explanation of glaucoma, because they show that glaucoma may exist without tension and without retention. Since simple and inflammatory glaucoma must be regarded as being due to the same morbid process, as I have shown above, it follows logically that retention is not the cause of glaucoma. Therefore another common cause of both varieties must exist. We may seek for this along various directions. We may start with the increased tension, we may start with the excavation of the nerve head, or best, we may start with the functional disturbances which appear in simple glaucoma without there being increased tension.

Simple glaucoma is chiefly characterized by the absence of all objective symptoms. There are no circulatory disturbances in the anterior half of the ball, little or no tension, and the excavation appears, as a rule, as a late sign. Externally and in its interior the eye appears normal in every respect, and only its functions are disturbed so as to indicate that a severe morbid process is under way.

This functional disturbance consists in a diminution of central vision, a narrowing of the field of vision, and a diminution of the light sense. In different persons these disturbances appear in different degrees and in varying reciprocal relations, so that there is no fixed rule in regard to their appearance. The central acuteness of vision often tends to diminish considerably while peripheric vision is still good; in other cases the contrary is the case, and in others the two disturbances advance with equal rapidity. Not infrequently the contraction is to the nasal side, and this special form has been regarded as the type of contraction in glaucoma. However, there may be contraction to other sides, and even sector-like defects are so frequent that we cannot speak of a typical glaucomatous field. The disturbances of peripheric and central vision thus appear in various forms, the field sometimes suggesting that of atrophy of the optic nerve and sometimes a hemiopic defect. The condition of central vision and of the field of vision, therefore, gives us no clue in regard to the nature and origin of the disease, since the disturbances might be attributed as well to an atrophy



of the optic nerve as to a morbid process in the retina. But the deduction of the light sense in simple glaucoma is a true indication of the nature of the fundamental cause. This symptom of glaucoma is generally overlooked or but lightly regarded. After Förster first noticed it, Mauthner was the first to call attention to its great importance in interpreting the nature of glaucoma. Mauthner came to the conclusion that the reduction of the light sense was one of the most frequent, not to say permanent, symptoms of glaucoma, and from my own experience I can fully confirm Mauthner's observations. In the beginning of simple glaucoma it is not infrequently the hemeralopia which is the only prominent symptom and leads the patient to the physician. The central vision and field are normal or but slightly affected, the tension is often normal, and only the reduction in the light sense calls the patient's attention to his affection. This hemeralopia may appear several years before the other symptoms of glaucoma. Such a case is the following now under my care:

An old lady came to me in the fall of 1892 complaining that she had difficulty in going about after dusk, and that reading or fine work was difficult even by daylight, since the eyes soon tired. On examination it was found that she had a low degree of myopic astigmatism with  $V = \frac{6}{8}$ , field and fundus normal. Light sense reduced = 4mm Förster's photometer. Not being clear in my mind as to the cause of this disturbance of vision, I endeavored to improve it by correction of the refractive error, tonic treatment, and subcutaneous injections of strychnine. The condition became better. In 1898 the patient noticed that her vision had grown worse in both eyes, but particularly the right, in which from time to time she felt a slight but lasting pain. It now appeared that in both eyes a simple glaucoma had developed with diminution of vision, contraction of the field, and beginning excavation of the nerve head. The right eye was the more affected, and in this the tension was manifestly increased. In the left eye tension was normal. Iridectomy in both eyes and 10-15 strychnine injections repeated three times a year have kept the vision as it was in 1898.

The hemeralopia thus appeared five years before the other

symptoms of simple glaucoma became manifest, and there is no doubt that the hemeralopia was the first evidence of the beginning glaucomatous process.

However, the hemeralopic disturbances are not always noticed by glaucoma patients, because the reduction of light sense is so slight that it is overlooked while it is confined to the periphery of the field. I believe that there are very few, if any, cases of simple glaucoma in which careful examination of the periphery of the field will fail to show a reduction of the light sense. This reduction, whether affecting the entire field or only a part of it, is one of the most characteristic, and certainly the earliest, of all the symptoms of simple glaucoma. Since hemeralopia must be considered the first expression of the glaucomatous process, we must ascertain wherein the cause of the hemeralopia lies.

According to all experience, the cause of hemeralopia is a functional disturbance of the rod-and-cone layer of the retina. In consequence of imperfect nutrition, these elements fail to functionate in a normal manner. They require a stronger excitation in order to permit perception. While ordinary daylight is still sufficient to allow these elements to functionate, the lesser light of dusk does not permit perception. Vision at dusk is completely lost or greatly reduced. The cause of the subnutrition of the rods and cones is due to a disturbance in the source of nutrition for these elements. Since the layer of rods and cones is not provided with vessels, and the retinal vessels nourish the inner layers of the retina only, we must seek the cause of the subnutrition in the inner layers of the choroid, whose vessels supply the outer layers of the retina. In the choroid, then, we must seek for the cause of simple glaucoma.

What the nature of the process may be is *a priori* hard to say, since pathological investigations on this point are incomplete and relatively rare. However, it has been shown that an extensive atrophy of the choroid is a constant condition in glaucoma. Goldzieher, as early as 1875, spoke in favor of the view that a choroidal atrophy was the cause of glaucoma. Fuchs also held this view, and thought that in most cases one could discover changes in the choroidal

pigment with the ophthalmoscope, although these changes were frequently limited to the anterior portion of the fundus and thus escaped notice.

For my part, I agree entirely with the opinion expressed by Goldzieher and Fuchs. I have often been surprised to find fundus changes in simple glaucoma that were in every respect similar to those occurring in retinitis pigmentosa. I believe that the cases of acquired retinitis pigmentosa with glaucoma following, which we find reported in the literature, are nothing but cases of simple glaucoma with marked atrophy of the choroidal pigment. In other cases of simple glaucoma these changes are slight and are limited to an irregular distribution of the pigment, giving the fundus a mottled appearance, or they may be altogether wanting. This, however, does not exclude the existence of an atrophic process, since in so marked a choroidal process as retinitis pigmentosa not infrequently all signs of atrophy of the pigment are wanting.

We can imagine an atrophic process taking place in the chorio-capillaris leading to a disturbance of nutrition in the rods and cones, without, in the beginning at least, injuring the pigment. In the later course of the disease, differing in different cases, greater or less changes appear in the pigment, and cases of red simple glaucoma are rarely found in which there is not more or less atrophy of the pigment, sometimes over the entire fundus, sometimes more particularly in the periphery, and again in a zone about the disc.

The functional disturbances in all the varying forms of simple glaucoma are in perfect accord with the supposition of a choroidal atrophy of this sort. The diminution of the light sense, the narrowing of the field of vision, and the diminution of the central vision may readily be regarded as results of the atrophic process. The atrophy does not extend at once over the entire choroid, but begins usually in the periphery and gradually extends toward the centre, although sometimes the reverse of this process is observed. Limited areas extending from the periphery toward the centre and islets of atrophy may be present and cause the different defects in the field which we see in simple glaucoma.



Passing from the functional disturbances to the second principal symptom of simple glaucoma, the excavation of the nerve head, let us try to discover how far this symptom is the result of the choroidal process. Most authors since v. Graefe have regarded this symptom as the direct result of increased intraocular tension, as the expression "pressure excavation" indicates. I shall hope, however, to show in what follows that this idea is not correct.

The intraocular tension exercises its influence uniformly over the entire ball, distending its walls in every direction. The resistance of the walls offers an obstacle to the distension, and the two forces are opposed.

What the conditions would be if the intraocular tension increased while the resistance of the walls remained normal is hard to say, since we have no clinical experience on this point. The bulging of a portion of the wall with increased tension, as in leucoma adherens with secondary glaucoma, gives us no information in this regard, for here there has been disease in the eye and the resistance is weakened. Locker's physiological experiments on normal eyes have shown that the intraocular tension must be raised to 135 $mm$  Hg in order to produce excavation of the disc. Since this pressure is much higher than is ever found in glaucoma, where it ranges from 30 $mm$  to 80 $mm$  Hg, and only exceptionally reaches 100 $mm$ , it is probable that the increase in intraocular tension, as we find it in diseased conditions of the eye, is not sufficient to distend the walls of the eye, if they are healthy and of normal resisting power.

The matter is different when the resistance is diminished by a preceding inflammatory process such as a sclero-choroiditis, for then the normal tension may cause a bulging of the affected part, as in intercalary staphyloma and the like. The conditions are similar with regard to the nerve head.

The normal disc possesses sufficient resistance to withstand not only the normal tension, but also a considerable increase. In cases of adherent leucoma, in which the tension is often considerably increased, we find not infrequently that the disc is entirely normal, although it has been exposed for years to the action of increased tension. Even in



glaucoma with greatly increased tension we find at times no excavation of the nerve head. Recently I saw a case of chronic inflammatory glaucoma with greatly increased tension of six months' duration, in which the nerve head was not excavated or even atrophic in appearance, although  $V = 0$ . Many cases like this have been reported. Even Mauthner described such cases. An increased tension need not cause an excavation of the nerve head, but on the other hand it seems that an excavation can take place without an increase in tension. In numberless cases of simple glaucoma with tension normal or but slightly increased, an excavation is found. I recall a case of simple glaucoma in a young woman, in which there was no increase in tension, but yet the nerve head was excavated to a degree that I have never seen equalled. The excavation thus may come on independently of increased tension, and therefore should not be designated as pressure excavation. The excavation must depend upon the fact that the tissues of the disc have lost in greater or less degree their resistance. Only two elements can come into consideration—the nerve fibres and the connective tissue composing the lamina cribrosa. One can scarcely believe that the nerve fibres offer any great resistance to the intraocular tension, and in genuine optic-nerve atrophy with complete disappearance of the nerve fibres the nerve head shows no signs of excavation. The slight depression left by the disappearance of the nerve mass cannot be designated as an excavation and has nothing in common with the glaucomatous excavation.

It is therefore the connective-tissue lamina cribrosa which furnishes the resistance against the intraocular tension. The lamina cribrosa is formed of numerous interlacing bundles of connective tissue, leaving openings for the passage of the nerve fibres. Although the sclera furnishes the main portion of the lamina cribrosa, the choroid takes some part in its composition. A great number of vessel-bearing tracts from the surrounding choroid pass into the nerve trunk and branch in the anterior layers of the lamina cribrosa. These vessels have a thick structureless elastica and a well-developed muscular sheath. The tracts themselves are so

richly pervaded with elastic fibres that these in fact make up the principal part of the connective-tissue structure of the lamina.

Pathological investigations have shown that in glaucomatous excavations a considerable atrophy of this connective-tissue supporting framework is always found. Thus, for example, Czermak and Birnbacher (*Graefe's Archiv*, xxxii., 4) found in a relatively fresh case of glaucoma the lamina cribrosa pushed back  $0.65\text{mm}$  behind the plane of the lamina vitrea of the choroid. The tracts of the lamina cribrosa were forced together from before backwards and the lamina thus considerably thinned. Only the fibres from the posterior part of the sclera were clearly to be seen, the anterior scleral and the choroidal fibres not being clearly made out. "The papillary tissue is atrophic." Only in fresh cases are capillary loops to be found in the posterior layers of the lamina cribrosa, while in other cases they are wholly absent. An atrophy of the elastic tissue of the lamina — namely, of the inner portion which arises from the choroid — is unmistakable.

Whether this atrophy is the result or the cause of glaucomatous excavation is difficult to decide from a pathological standpoint, since the investigations made have been on eyes with old glaucoma in which it was no longer possible to distinguish primary from secondary changes, and only the examination of a fresh simple case could give us definite information. Since, however, as we have seen, the cause of the excavation is to be sought not in the increased tension but in a diminished resistance of the papillary tissues, it is probable that the atrophy is primary and the excavation secondary. As the anterior portion of the lamina is a direct continuation of the choroid, we may assume that an atrophic process running its course in the latter would also involve the elastic tissue and thus lead to the excavation.

The atrophic process in the choroid is to be regarded as the cause of the functional disturbances occurring in simple glaucoma. The diminution in the light sense is a result of this process and the malnutrition of the rod-and-cone layer which it causes. The contraction and other defects in

the field, as well as the diminution of central vision, are results of the increasing malnutrition and the gradual degeneration of the rods and cones. Since this atrophy of the choroid, as a rule, extends to the elastic fibres of the lamina cribrosa, the latter lose their power of resistance and the intraocular tension causes an excavation. The excavation of the disc is indeed one of the most constant and most characteristic symptoms of simple glaucoma and is independent of the existence or non-existence of increased tension.

Increased tension is frequent in simple glaucoma and is the chief feature of inflammatory glaucoma. I have thought that it might be explained in the following way as a result of the choroidal atrophy: The intraocular tension is dependent upon two factors—the resistance and elasticity of the surrounding membranes and the pressure exerted upon them by the contents of the eyeball. The first factor is of little importance, but the pressure of the included liquids is of great importance. When the liquid increases, the tension increases, and *vice versa*. The quantity of the liquid contained in the eye is regulated chiefly by two factors—secretion and absorption, which as long as the circulatory relations are normal balance each other and keep the tension uniform. With either of these factors disturbed, the circulation of the ocular lymph is altered and the quantity of liquid is increased or diminished until secretion and absorption balance and the tension adapts itself to the new conditions.

There is a third factor, however, which plays no small rôle in regulating the circulation of liquids in the eye, although it has hitherto been disregarded. I refer to the pressure which the choroid exerts upon the liquid contents of the ball and particularly upon the vitreous. It is evident that the tension of the choroid is considerable, as is shown by Donders's observation that when all the coats of the eye are divided together the choroid retracts from the margin of the wound and leaves the sclera exposed. This contractility of the choroid is doubtless due to the numerous muscle fibres which accompany the larger vessels throughout the entire membrane. Besides, the choroid gains considerable contractility through Bruecke's muscle which acts as a tensor.



But, besides the function of the choroid as a restrainer of the intraocular tension, it has the further function of increasing the lymph circulation of the eye. If we think of the choroid as surrounded by a muscular network and suppose that this network contracts, the result will be that the entire choroid is drawn together, thus exercising pressure upon the vitreous and increasing the currents of liquids in the eye.

An atrophic process in the choroid, when it involves the outer portion, the layer of large vessels, exerts a paralyzing effect upon the muscle network and diminishes the contractility of the choroid, and thus causes a slowing of the lymph current. So long as secretion and absorption remain undisturbed and balanced, the intraocular tension remains unchanged. But in consequence of the slow circulation the ocular liquids pass more slowly through the channels of exit, and all the formed elements of the blood, such as cells, fragments of cells, pigment granules, and the like, are deposited in the channels, gradually blocking them. The liquid in the eye increases and the tension goes up. But with the increased tension the canals are forced open and the circulation becomes normal until the canals are blocked again and the increased tension returns (prodromal stage).

It may happen that the stoppage of the channels of exit is so considerable that the increased tension is not sufficient to open them. The tension then increases more and more and disturbances in the circulation of the blood are added. These disturbances are exclusively of venous character and depend upon a hindered exit of the venous blood through the *venæ vorticosæ*. The anatomical relations of the *venæ vorticosæ* in man especially favor such a venous stasis, since they pass obliquely through the sclera and valve-like are compressed when the tension rises.

The result is a congestion in all the veins that empty into the *venæ vorticosæ*. This stasis is well marked in the ciliary body, the iris, and the circumcorneal veins, and is the cause of the circumcorneal injection in glaucoma. Even the veins of the conjunctiva may be congested and cause a chemosis. As a result of this venous stasis there are an



excessive exudation of liquid into the vitreous and an emigration of red and white corpuscles, causing a more or less pronounced opacity of the media. The tension is by this still further increased and the venæ vorticosæ more compressed. The glaucomatous, vicious circle is completed, and the glaucoma does not undergo retrogression (glaucoma inflammatorium evolutum).

In glaucomatous increase of tension three factors are at work: the paralysis of the muscular network of the choroid, causing a slowing of the currents of liquid; the channels of exit which, in consequence of the retarded flow, through the deposit of the formed elements, become blocked and cause a retention of the ocular liquids; and finally, the anatomical arrangement of the venæ vorticosæ, which are compressed by the increased tension and thus lead to a general venous stasis with all its results. Each of these factors may affect different persons in different ways and thus give rise to different manifestations of glaucomatous increased tension. The paralysis of the muscular network may be more or less intense. It may develop quickly or require years. The channels of exit may present great variations: sometimes they are wide and straight and are blocked with difficulty, and sometimes they are narrow and tortuous and are readily blocked. Sometimes the mouths of the veins are readily compressed, and again they remain free and open. When all these factors work together in one and the same unfavorable direction, arise the stormy acute inflammatory malignant glaucomas which resist every therapeutic effort and destroy the eye within a short time. If the conditions are less favorable, inflammatory glaucoma may of its own accord or from eserine treatment pass off altogether or pass over into simple glaucoma. When the conditions for venous stasis are relatively good, it may happen that the circulatory disturbances appear in a very mild form, or are absent as in simple glaucoma. In fine, all the manifold forms in which acute and chronic glaucoma appears may be explained readily by the various ways in which the factors work together or in opposition.

In regard to the symptoms of inflammatory glaucoma, I

have supposed the disturbance in circulation to be a result of the venous stasis. This stasis may in certain acute cases extend to the conjunctiva and give rise to chemosis. An injection more or less pronounced of the circumcorneal veins is always present. The venous stasis in the iris and ciliary body causes an increased transudation and a haziness of the media, but excites no inflammation. One of the erroneous ideas in regard to glaucoma that has prevailed since Graefe's day is that the disturbances of circulation in glaucoma depend upon an inflammation. In fact, however, none of the symptoms which characterize inflammatory iridocyclitis is found in acute glaucoma, excepting only the circumcorneal injection, which here is of a different character. The pupil is not small, synechiæ are absent, the cloudiness of the aqueous differs from that in iritis, and the "inflammatory" symptoms vanish in a few hours under the use of eserine, which certainly would not be the case if an inflammation existed. The name inflammatory glaucoma is therefore misleading, and for it should be substituted congestive glaucoma.

In congestive glaucoma, the diminished sensibility of the cornea, the shallow anterior chamber, and the immobile dilated pupil are the results of the increased tension of the vitreous and the paralyzing effect of the pressure upon the ciliary nerves.

The diminution of vision in congestive glaucoma is also to be regarded as a result of the increased tension. The cloudiness of the media has its effect on the diminution of vision, but it is not the sole factor, for often the vision is very poor when the cloudiness is not excessive, and after the use of eserine or the performance of iridectomy the acuteness and the field of vision greatly improve, indicating that the increased tension had affected the rods and cones.

In acute congestive glaucoma, the vision always improves as soon as the tension is reduced to normal, provided that from the long continuation of the increased tension the rods and cones have not suffered materially. The disturbance of function in acute congestive glaucoma, at least at first, is always of a functional nature.

In simple glaucoma, the matter is somewhat different: here the disturbance of function, when it has gone so far that central vision and the field of vision have been reduced, always depends upon an atrophy of the corresponding nerve elements. This difference in the two forms of glaucoma depends upon the difference in development in congestive and in simple glaucoma.

In simple glaucoma, the atrophy is chiefly in the inner layers of the choroid—in the chorio-capillaris. The nervous elements—the rods and cones—are early affected and with the insufficient nutrition soon are destroyed. If with this is associated an atrophy of the elastic fibres of the retina with excavation of the disc, the nerve fibres also begin to be affected, and this hastens the diminution of vision. In this way the process, without other disturbances than a continuous decrease in the functions of the eye and an increasing excavation of the disc, or, in other words, under the form of simple glaucoma, may for a shorter or longer period, often as long as several years, continue until it has caused an atrophy of the outer layers of the choroid, or extended to the layer of larger vessels and caused a paralysis of the muscular network of the choroid, by which the circulation is checked and tension rises. The acute glaucoma has thus changed its nature and passed over into the congestive form.

If the atrophic process begins in the outer layers of the choroid without involving the chorio-capillaris, there arises an acute congestive glaucoma which, if relieved, can recede to the normal function of the eye and an apparent *restitutio ad integrum*. Since the chorio-capillaris is healthy, the retina functionates normally and the acuteness of vision remains normal. The eye may therefore, despite a congestive glaucoma, if a successful iridectomy is done, present for years the appearance of a healthy eye. The atrophic process continues, however, rapidly or slowly, and finally affects the chorio-capillaris and with it the nervous elements of the retina. The disease then assumes the character of a simple glaucoma.

Whatever the nature of this atrophic process may be cannot be said offhand, since the pathological examinations



available give no information in this regard, mostly having been made in old cases, and the chief attention given to the ligamentum pectinatum, the other parts of the eye receiving little attention. Yet the atrophy of the choroid is one of the most constant findings. This atrophy affects different layers of the choroid in different persons and even different areas. In whatever form it appears, it has usually a very slow course. Yet the course may be rapid, as in the following case.

The wife of a laborer, fifty-seven years old, presented herself some years ago at our clinic with an acute congestive glaucoma of the right eye of two days' duration and causing great pain. The symptoms were not very marked. The circumcorneal injection was slight, the cloudiness of the media slight, the tension greatly increased, and  $V =$  fingers at 4m. The anterior chamber had its normal depth, the pupil was dilated, and the iris in its lower part was greatly atrophic. An iridectomy upward was made at once with good result. The left eye, carefully examined, seemed normal in every respect, and the iris responded promptly. A few days after the operation on the right eye, there was an acute attack of glaucoma in the left. This came on at 11 o'clock at night, and when I saw the patient at noon on the following day the iris was quite atrophic, so that the lens everywhere shimmered through. Here a complete atrophy of the iris had taken place in less than twenty-four hours. It was impossible for an inflammatory process to have brought about this atrophy. The only possible explanation is that a trophic nervous influence existed, and this was probably also the cause of the atrophy of the choroid. Where the nervous cause is to be sought, whether in the sympathetic, as Abadie believes, or elsewhere, I am not prepared to say.

From what has been said, it is evident that the prognosis of glaucoma in general must be considered bad, because we have no remedies which will act upon this atrophic process. But since the process differs greatly in different cases, so the prognosis differs greatly. In simple glaucoma, the prognosis is always bad. In congestive glaucoma, iridectomy or the use of eserine may relieve the tension in many cases and restore the normal circulatory conditions in the eye. The



atrophic process in the choroid continues, however, extending to the chorio-capillaris, and blindness is here also the final outcome. But this may be delayed for many years.

We are unable to say whether the atrophic process in the choroid may cease spontaneously, but it is improbable.

In regard to the treatment of glaucoma, we have not yet been successful in finding a sure means of checking the atrophic process in the choroid. The question whether Jonnesco's sympathectomy has a future cannot yet be answered, since the observations are few and the reports contradictory. Personally I have had no experience with it. But, on the contrary, I believe that I have found in repeated injections of strychnine a measure to prevent the spread of the atrophic process. In simple glaucoma, with little or no increase in tension, strychnine injections, one a day for ten to twenty days, repeated three or four times a year, have enabled me to preserve the vision for many years, although in more than half the cases the diminution of vision has continued unchecked.

In simple glaucoma, there is no indication for iridectomy as a curative procedure; but since an acute congestive attack may come on in a case of simple glaucoma, iridectomy is of prophylactic value, and the operation is more easily done in the quiescent stage than in an acute attack.

Iridectomy, as in v. Graefe's time, remains the sovereign means of reducing increased tension. Its action, however, is not understood, and has been interpreted by different writers to suit their theories of glaucoma. The adherents of the retention theory attribute its action to the opening of the filtration angle and the facilitation of the outflow of liquids from the eye. Since this theory has obtained the most general acceptance, we may discuss it here. In order to be efficacious, the iridectomy must be as peripheric as possible. The lance knife must be entered *1 mm* outward from the sclero-corneal junction and passed into the anterior chamber parallel to the surface of the iris, so that the section will lie close to the root of the iris. When the root of the iris is adherent to the cornea, it is absolutely impossible to enter the anterior chamber in this manner. The section

must lie farther forward in the cornea. When the iris is drawn out with the forceps, only the free portion comes, the root of the iris remaining behind. This is seen in eyes examined microscopically. In such cases there can be no hope of releasing the root of the iris and restoring the filtration angle. Such adhesions, however, are found only in old cases of chronic congestive glaucoma in which there can be no hope of curing the glaucoma and restoring normal conditions, and I dare to assert that no one has cured such a case of glaucoma. In all the cases of glaucoma in which iridectomy has been of service, the angle of the interior chamber must have been open, otherwise the lance could not have entered.

The retention, therefore, does not depend upon the fact of the angle being more or less open, so long as it is sufficiently open to permit the passage of the knife; for if this is possible liquids also may pass. The check to circulation is thus not in the angle itself, but in the surrounding tissues and fine canals which lead through these tissues to the circumcorneal veins. When a portion of the iris is removed, it does not follow that the channels of exit are opened and resorption increased, but rather the contrary, since a portion of the absorbing surface of the iris has been lost. This is shown by the simple clinical observation that blood in the anterior chamber is readily absorbed where the iris tissue is preserved; but in the coloboma, particularly when this is downward, the blood may remain unabsorbed for weeks. This certainly does not indicate that the iridectomy has opened the filtration angle.

After a successful iridectomy in acute congestive glaucoma, it is always the so-called inflammatory symptoms—that is, the disturbances of circulation—that first pass off, and the beneficial effect of iridectomy lies in its effect upon the circulation. The most probable explanation of the action of iridectomy in glaucoma is that given by Exner. In the operation a portion of the iris is removed up to its ciliary attachment, and the short arterial twigs which proceed from the major arterial circle of the iris have the opportunity to form direct anastomoses with the corresponding venous

twigs. The arterial current can thus pass directly into the veins without being obliged to pass through the fine-calibred and rich capillary network. The resistance in the blood current is therefore diminished, and the tension sinks not only in the short arterial stumps, but also in the entire major circle and in the choroid. Iridectomy thus works, as Knapp expresses it, as a safety-valve.

The increased intraocular tension is, as before stated, a result of the slowing of the currents in the eye, which occurs when the contractility of the choroid diminishes in consequence of the action of the atrophic process upon the muscular network in the layer of larger vessels. The formed elements in the ocular liquids then become deposited in the fine channels of exit and block them and the tension rises. If now the anatomical relations of the *venæ vorticosæ* are unfavorable, it readily happens that compression results with venous stasis, which again increases the tension and completes the vicious circle which causes congestive glaucoma. The purpose of the iridectomy, therefore, is to break this last link in the chain and prevent the venous stasis.

If the iridectomy is successful in preventing the development of the venous stasis, the tension becomes normal or but slightly increased, according as the channels of exit have become patulous or not.

The glaucomatous process is not at an end after the iridectomy, but, as a rule, progresses. As a rule, many of the patients operated on for acute glaucoma complain of slight temporary attacks of cloudiness of vision and increased tension without permanent injury to the vision.

In this way the condition may continue for years, until a fresh acute attack occurs, or the disease gradually assumes the character of a chronic congestive glaucoma with continued diminution of vision; or there may be no attacks, the eye appears normal, and its functions continue normal for years. But eventually central vision becomes poorer, the field contracts, and the nerve head becomes excavated.

When a fresh acute attack occurs, or the disease assumes the character of a chronic congestive glaucoma, an iridectomy opposite the first may again give relief and the eye



functionate again. Finally, however, vision decreases more and more and the tension increases, with severe pain. Posterior sclerotomy, perhaps repeated, may give temporary relief, but at last we can only relieve the patient by enucleation or evisceration.

An anterior sclerotomy may doubtless in many cases relieve a glaucoma, but in most cases its action is nil. When the wound heals, the effect of the operation is at an end, and an iridectomy has usually to be made.

In cases in which anterior sclerotomy is of no benefit, posterior sclerotomy may be tried. With a cataract knife, a longitudinal section 3 to 4mm long is made through the sclera in the equatorial region. In order to be sure that the wound will not close immediately, a second section may be made perpendicular to the first. Thus there is formed a triangular wound which remains open several days and allows the vitreous fluid to trickle through. The eye remains soft, and there is time for the circulatory disturbances to pass off. These operations, particularly the posterior sclerotomy, are indicated rather in the old cases that have run their course, in which there is no question of the restoration of vision, but a desire to relieve the patient's pain.

In fresh cases of acute congestive glaucoma in which for any reason iridectomy cannot be done, frequent instillations of eserine act best in reducing the tension. Sometimes a single or several instillations are sufficient, but usually many are necessary. I have sometimes had to instil eserine forty to fifty times in the course of twenty-four hours in order to reduce the tension. As a rule, I begin the treatment of a glaucoma with frequent instillations of eserine, and after becoming convinced of its futility I proceed to operation. In this way the congestive symptoms are checked and the operation can be more satisfactorily performed and a better result obtained than when one operated in an acute glaucomatous state.

Eserine causes a contraction of the muscles of the eye. Through contraction of the tensor of the choroid and probably also through its action upon the muscular network about the choroid, this membrane is rendered tense and the



tension falls. The pressure upon the sclera is relaxed and the mouths of the venæ vorticosæ open. The venous blood escapes from the eye and the circulatory disturbances are relieved. When the atrophic process in the layer of large vessels has gone so far that the muscular network and the tensor are completely paralyzed, eserine has no effect. Unfortunately, as I have remarked, this is often the case. The contraction of the pupil has no curative effect, but may furnish us an indication that the contractility is preserved and that we may hope for a favorable effect upon the deeper-lying muscular fibres.

In simple glaucoma in which the atrophic process is confined exclusively to the chorio-capillaris, eserine has no effect, but as it is not possible to say whether the process is confined to one layer alone, we may take it for granted that different layers are affected, though in different degree, and hence in most cases of simple glaucoma a continued use of eserine acts well and in many cases prevents increase of tension.

## A CLINICAL CONTRIBUTION TO TRAUMATIC ENOPHTHALMUS.

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Abridged Translation from Vol. XXXVIII., 2 (1898), of the German Edition,  
by Dr. WARD A. HOLDEN.

**A**LTHOUGH in recent years a fairly large number of reports of traumatic enophthalmus have been published, the views in regard to its true nature are still divergent, as the latest communications show.

The chief reason for this difference is doubtless due to the fact that the cases reported are in reality of different nature, which is true of other clinical pictures, as particularly Schapinger and Th. Beer have pointed out.

We should exclude here the cases in which severe trauma has destroyed a portion of the skull about the orbit. Such cases I have repeatedly observed. In one case a dog was said to have struck a miner in the superior maxillary region, so hard that the upper and anterior portions of one superior maxilla were completely shattered, so that the ball sunk into the antrum of Highmore. In a second case, a kick from a mule's hoof produced a similar effect. It does not surprise us that under such circumstances a direct extensive dislocation of the ball takes place. In a strict sense even those cases should be excluded in which, according to Gessner's view, a cicatricial shrinking of the orbital tissues following inflammatory processes comes on after a trauma in the region of the eye. Still these cases differ little from the pure cases in which, while the walls of the orbit remain normal, a non-inflammatory sinking of the eyeball appears

more or less quickly, which Beer refers not to paralysis of the sympathetic or pressure atrophy, but simply to trophic disturbances in consequence of the injury of peripheral nerves.

Every new case-history may assist in clearing up the question, and a case which came under my observation follows:

Anton Z., aged forty-six, was admitted to the hospital Oct. 14, 1897. He had previously enjoyed good health until five weeks before, when being struck by a cow's horn he suffered an injury in the region of the superior wall of the orbit, and a second in the region of the inferior wall. These wounds were sutured by the local physician. He was dazed for a time but did not lose consciousness. There was some hemorrhage from the nose. The eye was so swollen that the patient could not see out of it for a week.

The patient came with the complaint that he could not raise the upper lid properly and that he still had pain in the depth of the orbit.

*Status præsens.*—At first glance one noticed the smallness of the left palpebral aperture, and the deep location of the ball in the orbit, as if the patient were wearing an artificial eye. Noticeable also is the circumbulbar sinking in of the lids, and the left cheek seems to be less developed than the other. When more closely examined, one sees a scar, partly keloid-like, beginning near the incisura supraorbitalis, or the superior margin of the orbit, and extending nearly to the outer margin of the orbit. A second, shorter scar, similar in character, is seen at the inferior margin of the orbit. Neither scar is adherent and both move readily over the bone.

The length of the palpebral aperture is 22mm and its height 5mm as compared with 25 and 10mm on the right side. No deformity of the bony margin of the orbit can be felt, but the patient complains of pain when firm pressure is made against the superior margin. There is furthermore a marked anæsthesia in the region of the supraorbital nerve, but the eye itself is not anæsthetic. The ptosis leaves only the lowest third of the pupil clear, and when the other eye is wide open there is but slight elevation of the left upper lid. The eyeball is sunken at least 3mm into the orbit. Conjunctiva, lachrymal sac, and the external portions of

the eye are entirely normal. The cornea in its primary position is  $1\frac{1}{2}$  mm higher than the right. The pupils are of equal size and each reacts normally.

R, V =  $\frac{3}{10}$ ; with 1.5 =  $\frac{3}{8}$ .

L, V =  $\frac{3}{10}$ ; with 1.5 =  $\frac{3}{8}$ .

Accommodation intact.

Movement of the eyeball inward of normal extent, movement downward practically abolished, yet there is a rotary movement due to the action of the trochlearis. The excursion outward is of moderate extent and with it the upper end of the vertical meridian inclines outward. Movement upward very limited.

The patient does not complain of diplopia, yet after raising the lid and holding a red glass before one eye diplopia occurs, but the significance of it is uncertain on account of the complicated paralyzes.

The color fields are normal, and the fundus is normal in each eye.

The experiment of subcutaneously injecting pilocarpine for diagnostic purposes with reference to the sympathetic, suggested by my colleague, Dr. Pichler, resulted negatively.

After ten days the patient was discharged as there was no hope of improving his condition.

To this case I can add a brief sketch of another in respect to which I find myself in the same position as Beer with his second case.

The patient could be but briefly examined because of lack of time and did not keep his promise to return.

A man of about twenty while serving in the cavalry was kicked in the right frontal and temporal region a year before. There was no swelling in the region of the eye, yet he became suddenly and permanently blind and has since been able to open the eye only with difficulty. He stated that the eye at once became smaller. At the time of the examination the patient complained of diminution of vision in the left eye.

Externally no scar. Right eye quite closed, but with an effort it can be opened fairly wide. The eyeball of normal appearance is so deeply sunken in the orbit that the patient has worn an artificial eye over it. Movements in all directions normal; no deviations. V = 0; complete atrophy of the right optic nerve. L ophthalmoscopically normal. V =  $\frac{3}{8}$ .



Before proceeding to the discussion of these cases, I wish to refer to some of the more recent reports which have appeared since the fundamental paper by Th. Beer from Fuchs's clinic.

The first of the more recent cases is that of Georg Cohn':

A man was struck on the eye, and suffered a fracture of the superior maxilla, by a tame deer which had suddenly become wild.

The latter factor rather rules the case outside of our category, although the author believes that besides the fracture a cicatricial contraction of the orbital connective tissue contributed to the production of the enophthalmus.

Two recent cases reported by Schapring<sup>2</sup> follow.

CASE 1.—A coachman, aged seventeen, was kicked in the eye four months before.

Ptosis. Enophthalmus. A non-adherent scar at the lower margin of the orbit. Cheek somewhat depressed. Sensibility undisturbed. No vertical deviation; good mobility. Pupil of medium size. Partial atrophy of the optic nerve.

The author assumed an extensive fissuring of the walls of the orbit.

CASE 2.—A woman of thirty. At the age of eight she fell from a wagon.

Ptosis. Enophthalmus. Normal mobility. No scars about the eye. Pupil normal. Vision good.

The author calls attention again to the importance of injury of the peripheral nerves as the probable cause of traumatic enophthalmus, and recognizes the significance of such injuries also for the trophoneuroses in the sense of Beer.

There should also be mentioned a case of Schwarzschild's<sup>3</sup> referred to by Schapring:

A coachman of twenty-two had fallen from a vehicle at the age of eight. Wound of the left eyebrow. The condition was regarded as the immediate effect of the trauma suffered, yet definite statements as to the exact time are wanting.

No mention was made of ptosis, nor yet of its absence. Vision and interior normal. Undiminished mobility, yet slight atrophy of the affected half of the face.

This case is not a typical one, since the enophthalmus of 6mm became an exophthalmus of 6mm whenever the head was bent forward, as in similar cases described by Robert Sattler, Gessner, Sergeant, and others.

A further case, like Cohn's from being struck with a deer's horn, was demonstrated by Fuchs.<sup>4</sup>

The patient, a forester, had a ptosis of 4mm. The eye was 2mm lower than the other and was somewhat sunken into the orbit.

There was anæsthesia of the left cheek, under lid, nose, and lip; and diplopia due to paralysis of the inferior oblique. This diplopia was successfully relieved by tenotomy of the right superior rectus.

The cause of the enophthalmus was thought to be a fracture of the roof of the orbit.

Strictly speaking, perhaps this case does not belong in our category.

Another case was observed by Oliver<sup>5</sup> (cited by Neulen):

A weaver, forty-seven years old, had been struck by a shuttle in the left eye five weeks before. The eye and the surrounding part were then inflamed. The patient complained of diminution of vision in this eye. Enophthalmus of 4-5mm. Palpebral aperture 3mm narrower than the other. Almost complete paralysis of the superior rectus; paresis of the inferior oblique. Fracture of the bone not to be made out.

The case reported by Denig<sup>6</sup> is of importance :

A mason, aged twenty-six, fell from a height of 1m and struck on the left side of the head. No disturbance of consciousness, but vomiting, and hemorrhage from the right ear. Diplopia soon came on.

Ten days later the patient noticed that his left eye had become smaller.

Enophthalmus of 3mm with slight ptosis. Bilateral paralysis of the abducens. Left pupil considerably dilated but responsive. No scars and no depression. Suppurative otitis media. Paræsthesia of the left eye, cheek, and left half of the nose. Unilateral perspiration. Left cheek flattened. Otherwise normal. The enophthalmus, flattening of the cheek, and paralysis of the abducens continued.

Denig believed that the enophthalmus as well as the flattening of the cheek depended upon the fifth nerve proper and not upon its sympathetic fibres. The paralysis of the sixth nerves he attributed to a fracture of the base.

Denig's case, as he states, was the first until then observed in which enophthalmus followed injury of the skull. In the other cases there were injuries of the face.

Another case is that reported by Neulen<sup>7</sup> from Schirmer's clinic :

A patient, aged sixteen, was kicked eight weeks before and remained unconscious for twenty-four hours; after this there was amnesia as to what had occurred before. The left eye and left upper jaw were struck. On the cheek was a wound in the skin, which was sewed up.

In the first week there was much swelling. After this had passed off the patient noticed that he could only recognize movements of the hand with the left eye.

There was suppuration in the wound and several incisions were required.

Two large scars were found, one at the lower margin of the orbit in connection with a fistula which led to rough bone; the entire lower margin of the orbit was prominent and thickened. Ptosis of 6mm, enophthalmus of 3mm. Movements of the eyeball outward somewhat limited. Pupil slightly contracted.

Nothing is said of the acuteness of vision, but it must have been poor since there were two ruptures of the choroid and a white almond-formed patch at the macula.

Neulen in his dissertation concludes with Lang that traumatic enophthalmus is due to fracture of the orbital wall.

Two cases reported by Maklakoff, Jr.,<sup>8,9</sup> follow :

CASE 1.—A man of sixty-seven received a blow eight months before which caused a splitting of the lower lid. The swelling lasted two weeks. Then ptosis and sinking-in of the eyeball were observed.

No fracture could be made out and no irregularity of the face. No increased sensibility. No anæsthesia. Above and below a sort of symblepharon: dilated pupil, luxation of the lens, and opacities of the vitreous. V with + 12. D = 0.7.

There were muscular pareses.

The author, supporting his position by an observation of Jaboulay, who observed enophthalmus after resection of the sympathetic, believed that the lesion was in the region of the ciliary ganglion.

His second case was reported a year later :

CASE 2.—A cook, aged forty-two, received a blow from the fist of a thief on the right cheek, causing a wound in the skin. There was swelling at first and afterwards diplopia.

He found a long scar along the margin of the orbit. Sensibility diminished on the lids, cheek, forehead, and cornea. Pupils equal; accommodation normal. Paralysis of the external and inferior recti and of the inferior oblique.

The author locates the lesion at a point in the orbit about 4 $mm$  anterior to the optic foramen, close behind the ciliary ganglion. The primary cause he believed to be a hemorrhage from the ophthalmic artery. Above it lie the fibres of the sympathetic, outward the abducens, below the naso-ciliaris, farther below the inferior branch of the oculomotor, and farther above the superior branch. Hence one can understand why the internus remains most protected while the other nerves are so frequently affected. He distinguishes three groups according to the severity of the lesion.

A case was reported by Darier<sup>10</sup> simultaneously with his second case, which differed somewhat from it but was of particular interest from a therapeutic point of view :

A young man had a severe fall from a horse, and lay comatose for two weeks. Injuries of the face and probable fracture of the base. Hemiplegia and facial paralysis of the same side. At the beginning there was ptosis, and later an abnormal elevation of the lid. The eye moderately turned out. The pupil at first dilated, later normal. Only the abducens preserved its normal function. Accommodation preserved.  $V = \frac{1}{2}$ .

Darier assumes as the cause of the enophthalmus that from the severe contusion of the entire contents of the orbit an inflammatory condition of irritation of the retrobulbar tissue was set up, ending in the formation of a scar



which drew the eyeball backward and hindered the action of the muscles.

He agrees with the views of Gessner.

Darier deserves the credit of first relieving the enophthalmus by making tenotomies. A tenotomy of the tendon of the external rectus improved the condition, and then, in order to increase the effect, he tenotomized the other recti muscles with satisfactory effect, both from a cosmetic and from a functional point of view.

In the same number of the *Clinique ophtalmologique* there are two other references to cases of traumatic enophthalmus.

One by W. E. Brunner,<sup>11</sup> whose patient was a man of thirty-three, who fell, breaking the nose and the zygoma. Ptosis. The eye could not be moved upward. Pupils equal.

The author considered the ptosis as the mechanical result of the deep location of the ball.

A second by Roberts.<sup>12</sup> Fracture of the roof of the orbit from a horse's kick. Ptosis. Abducens paralysis. Death from meningitis.

Neither of the cases seems quite pure.

Strictly considered, of the new cases only those reported by Schapringer, Denig, Oliver, Neulen, and Maklakoff are quite free from criticism, perhaps also Darier's case, although it was complicated. The cases of Cohn and Roberts are to be absolutely excluded.

All the cases of traumatic enophthalmus not due to gross fractures of the orbit have in common: 1, the traumatic origin; 2, the enophthalmus; and 3, more or less marked ptosis.

It is evident that after the action of severe force upon the region of the eye or the skull other symptoms may be found. Thus there is rarely lacking a cut or a scar on the skin in the region of the orbital margin. An accompanying symptom almost as frequent is paralysis of ocular muscles, which, as Beer said, need not be orbital. In three cases, furthermore, there was dilatation of the pupil, and in one contraction. The accommodation seemed, as a rule, to be intact.

A remarkable accompanying symptom is an anæsthesia of

some branches of the fifth nerve, and another remarkable symptom is the unilateral atrophy of the face. Unilateral sweating, also, has been observed. Besides these, we find partial or total atrophy of the optic nerve, facial paralysis, and hemiplegia. In one case the enophthalmus became an exophthalmus when the head was bent forward. Finally in one case there were ruptures of the choroid, and in another opacities of the vitreous and luxation of the lens.

Maklakoff calls attention to the frequency of paralysis of the external rectus in these cases, and from this concludes that hemorrhage from the ophthalmic artery is capable on the whole of explaining the symptoms in traumatic enophthalmus. The abducens, because of its nearness to the artery, is particularly often affected.

On the contrary, I would state that, in the literature of injuries of the head, paralysis of the sixth nerve is much more frequently noted than paralysis of any of the other ocular nerves, even when the lesion is nuclear or basilar, so that its frequency in traumatic enophthalmus cannot be regarded as proving the orbital location of the lesion. This was made out in Denig's case only.

Yet on the whole we can say that the typical clinical picture of pure traumatic enophthalmus perhaps is not always due to the same cause. For there is not in all cases a fracture of the orbital wall enlarging the orbital cavity, nor is there in all cases a cicatricial contraction following orbital inflammation. There are, however, apart from fracture, some direct mechanical factors which are capable of causing a slight degree of dislocation of the ball,—thus, for example, a direct or indirect solution of continuity or loosening of the fascia of the orbit, or a loss of tension in the girdle of the obliqui. I believe that some weight must be placed in this idea. Tenotomy of the recti muscles causes exophthalmus, and Darier obtained by tenotomies a satisfactory correction of the enophthalmus in his case.

The possible rôle of the sympathetic was first suggested by Schapring. No one will deny that lesions of the sympathetic will cause ptosis, but it must not be forgotten that the most important factor in producing the ptosis in these

cases is the sunken location of the eyeball. Just as a protrusion of the ball after tenotomies will raise the lid, so an enophthalmus will allow it to droop. It is not surprising, then, that ptosis is found constantly in cases of enophthalmus; only Darier's case is an exception, for in this case the ptosis later gave place to an elevation of the upper lid. The ptosis may be considerable, because the levator may be paralyzed as well as the other muscles.

The explanation of the ptosis does not hold good for the defects in mobility of the ocular muscles. Beer called attention to the fact that through the enophthalmus itself a certain limitation of mobility of the recti might be brought about by the lessened distance between their origins and insertions with the consequent relaxation. But all the defects cannot be laid to the enophthalmus, since clinical experience shows that in most cases individual muscles alone are affected, indicating a direct lesion of the muscle or its nerve. Naturally a direct lesion must be held responsible for anæsthesia of the branches of the fifth and for facial paralysis.

From what has been said it appears that there are cases whose characteristics depend solely upon the traumatic enophthalmus. To interpret these pure cases we must rely upon the neurotic hypothesis of Beer, which clearly explains the sinking-in of the ball as being due to absorption of the orbital cellular tissue caused by lesion of trophic peripheral nerves. The atrophy of one half of the face and the anæsthesias clearly support Beer's idea, and Denig's case shows the direct involvement of the fifth nerve.

In accepting this explanation, other possibilities cannot be altogether excluded. The explanation on the ground of cicatricial retraction is not very probable, since the extensive scars are never adherent, nor is the bony wall of the orbit deformed. There is no adequate reason for supposing a particular injury of the obliques, and against paralysis of the sympathetic are the normal pupil and the similar condition of the two halves of the face after the subcutaneous injection of pilocarpine.

*The most probable explanation, then, is that of trophic disturbances of the orbital tissues following injury to the nerves.*

I do not feel qualified to state whether the disturbances of the ocular muscles are in the orbit or behind it. The fact that the intrinsic muscles are intact would speak rather in favor of the latter.

The second case, with optic-nerve atrophy, would indicate a fracture of the orbit, so that an exit of orbital contents could be regarded as probable. The case shows, however, that different causes may give rise to the same clinical picture or at least produce symptoms for which a uniform explanation is impossible. We lack, as Beer stated, autopsy reports.

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# THE SO-CALLED EMBOLISM OF THE CENTRAL ARTERY OF THE RETINA AND OF ITS BRANCHES.

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SINCE von Graefe in 1859 described the so-called embolism of the central artery of the retina, many cases have been observed, and the addition of cases of embolism of single branches has completed our knowledge of the clinical picture presented by the disease. The symptoms are typical and always the same in their important characteristics.

After one or more transitory obscurations of one eye, rarely of both, there is a sudden attack of blindness with no external cause and accompanied by no other subjective symptoms. The blindness remains complete, or, after a short time, the vision returns, very rarely back nearly to normal, usually to only a trace in the temporal portion of the field. Sometimes both eyes are affected simultaneously, but in different degrees, so that while one regains more or less normal vision, the other is permanently impaired. Sometimes the second eye is affected years after the first has been lost. Ophthalmoscopically the media are clear; the retina at the posterior part of the fundus presents a dense, white opacity with radiating striations about the pallid papilla, uniformly diffuse in the region of the macula, in the midst of which appears a red spot with regular margins. The opacity extends more or less toward the

periphery, gradually becoming thinner, and is bordered by flame-shaped spots. The blood columns, particularly in the arteries on the papilla and in its neighborhood, are smaller than normal, so that the vessel often appears as a fine red thread, or as a gray cord from which the blood stream emerges, spreading out in a conical form. More peripherally the blood columns are broader, but yet narrower than normal. Sometimes irregular constrictions can be seen where the blood columns begin to expand. In the course of time the vessels become better filled with blood, but they seldom again attain their normal calibre. Then a uniform diminution gradually takes place, which brings about the final condition. This general picture may be modified by the presence of little spaces supplied by the cilio-retinal vessels remaining unaffected, as well as by the involvement of a single branch alone, when the opacity will be confined to the part of the retina supplied by that branch, and a corresponding defect in the field of vision will be produced.

Such a clinical picture can be produced only by an obstacle which suddenly arrests the circulation of the blood in the affected artery and then after a time allows it to recommence. Such an obstacle must be in the central artery of the retina or in one of its branches, because if it were situated in the ophthalmic artery anteriorly to the point where the central artery is given off, the collateral circulation would be sufficient to prevent any serious damage to the retina, and if the supply to a larger vascular field were cut off, the correct diagnosis would be indicated by other symptoms which could not be overlooked.

This obstacle was supposed by von Graefe to be an embolus, but soon doubts began to be expressed in regard to the embolic nature of the lesion because certain symptoms did not accord with this supposition, and various theories were advanced which found few adherents and were usually open to severe criticism. Such lesions as inflammation of the retrobulbar cellular tissue, retrobulbar neuritis, and tumors must be excluded, because they would cause other symptoms in addition to the arrest of the circulation in the central artery and the partial necrosis of the retina from the

anæmia thus produced. The theory of a hemorrhage or an exudation into the sheath of the optic nerve was disposed of by von Graefe himself. Magnus suggested that an acute amaurosis could be caused by a hemorrhage from the central artery into the optic nerve so as to arrest the conductivity of the nerve fibres by laceration, crushing, or pressure, and that later, as the blood became absorbed, or was otherwise removed, conductivity could return to the fibres which had not been seriously damaged so that a part of the retina could resume its function. But, as Leber says, both a new problem is introduced in the cause of the hemorrhage and the hemorrhage itself is assumed to act in an extraordinary manner. It is to be expected that in case of such a hemorrhage the blood would follow the sheaths of the vessels or spread out among the larger nerve bundles so as to produce local injuries which would result in the formation of definite scotomata.

This hypothesis, and to a still greater degree those yet to be mentioned, necessitates that venous stasis should be a prominent symptom, but it is never present. It should also be noticed that none of these hypotheses explain the prodromata, the periods of improvement, or the circulatory conditions, and that they are not adaptable to embolism of the branches.

The interruption of the circulation has been ascribed to spasmodic contraction of the vessels by various authors, especially by Raynaud, who in 1862 described a clinical picture of periodic attacks of pallor, cyanosis, a feeling of impending death, œdema, and paræsthesia of the extremities, particularly of the fingers and toes, which frequently resulted in gangrene. He ascribed this to a spasmodic contraction of the arteries caused by a central vasomotor neurosis, which could be seen in the retinal vessels in the form of contraction of small isolated segments. But Panas states that he was unable to detect any such alternation of hyperæmia and ischæmia of the retina in any of the patients with local asphyxia of the extremities whom he examined at Raynaud's request. Although a spasmodic contraction of the muscular coats of the arteries sufficient to close their



lumen can be brought about by artificial irritation, it is not known that such a spasm ever occurs spontaneously. The unequal, short, persistent constrictions of the arteries may be ascribed much better to diseases of their walls than to spasm, for the thickening can often be seen as an opacity while the outer contour of the wall remains normal, and, according to Professor von Frey, an artificial spasm always affects the muscular coat of a vessel uniformly for a considerable distance. Vermiform contractions of the vessels, as described by Liebreich, is an erroneous interpretation of an ophthalmoscopic picture, perhaps of that here termed granular current. The group of symptoms described by Raynaud and called by Charcot intermittent lameness (*intermittirendes Hinken*) is commonly considered to be the result of endarteritis obliterans. Quinine amaurosis cannot be quoted in evidence, because the manner in which the amaurosis is produced has not yet been determined.

There remain only three possible forms of obstruction to the circulation which can produce the typical cases of so-called embolism of the central artery of the retina, embolism, thrombosis, and endarteritis proliferans. Before going farther, a symptom should be discussed which, in my opinion, has not yet been rated at its full value,—the granular current, or the breaking up of the blood in the blood-vessels. It was first noticed by Jaeger in 1854, and was described by von Graefe, Donders, and Cuignet. Donders saw it in conjunctival veins, Friedenwald in newly formed corneal vessels. It can always be obtained in the conjunctival and episcleral vessels when the blood is sufficiently retarded by suitable pressure. Jaeger in 1876 gave an accurate description of this phenomenon which I will summarize. At first the movement of the contents of the vessels becomes observable, presenting an appearance as if fine sand was being driven through a glass tube with great swiftness. The more the rapidity of the current is reduced, the clearer the granular appearance becomes, until there is a separation of the blood into red and white cylinders which, wherever the vessel branches, accommodate themselves to the corresponding diameters, though many times the red cylinders pass by



a little twig, particularly when it forms quite an obtuse angle with the main trunk, and this is left filled with a colorless fluid. When a red cylinder passes from a small vein into a larger one, it adapts itself to the increased diameter, becoming shorter and broader. Sometimes all movements cease and the cylinders remain motionless. When circulation is restored, there is often a pulsating fluctuation, the cylinders moving by starts. As the circulation increases in rapidity, the current passes from coarse-grained to fine-grained, until finally the vessels again hold uniform red columns and show normal reflexes from their walls.

Almost all authors who have studied this phenomenon agree that retardation of the circulation is sufficient to account for its occurrence. While the blood is in rapid motion the cellular elements form a pretty even mixture in the plasma, but when the circulation is considerably retarded the red blood corpuscles gather together in larger or smaller masses between which the plasma appears as a bright yellow fluid. As long as the current is fairly swift, the masses formed are small, so that they create an impression like that made by flowing sand, particularly in the larger vessels. As the current becomes slower, larger masses are gathered together into dark red cylinders separated from the light yellow plasma by sharply indented boundary lines, which resemble the fracture lines of cast-iron bars. The result of the agglutination of the red blood corpuscles is that when the current is slow they slip by a small twig given off from an artery at nearly a right angle, and as they are not tightly joined together they spread out and form a shorter mass when they pass from a small vein into a larger one.

Some similar condition must be present when the circulation is completely stopped and also after death. Knapp made the inexact statement that at death the arteries are emptied and all the blood segregated, some in the capillaries, but mostly in the veins. Von Schulten states more accurately that at the moment of death the vessels become emptied of a great part of their contents, which assume a venous character. But it is peculiar that although a tension of 8 or 10 *mm* prevails in the eye, much blood often remains

in the retinal and choroidal vessels whatever the cause of death may have been. Usually the columns of blood in the vessels are broken in several places. Schnabel and Sachs say that the papilla grows pale and its vessels attenuated shortly before death, and that immediately after death its vessels become light threads, often with red lines in the middle, while outside the papilla they are only partially filled.

The vessels can be said truly to be empty only when their physiological contents have been removed, and that is possible practically only with collapse of the walls. I have referred in a previous paper to the importance of this fact with regard to microscopical examinations, but point it out again because until very lately the expression, "the vessels are quite, or in places, empty," has been often met with in descriptions of ophthalmoscopic examinations, while the appearance referred to may be the result of collapse, of contraction, of pathological thickening of the walls of the vessels, or of the filling of the lumen with plasma, conditions which are very different and deserve to be differentiated.

Usher found a granular current at the moment of death, the blood columns broken to pieces afterward, and I have myself seen these post-mortem appearances in the eyes of rabbits and cattle. Nettleship, in a microscopical examination of an enucleated eye, found the blood column broken in many places, a phenomenon which he considered a post-mortem change. This filling of the vessels in places with agglutinated red blood corpuscles and plasma is naturally found in microscopic sections in vessels cut longitudinally.

In experimental section of the optic nerve and the central and posterior ciliary vessels, Wagenmann always found the blood columns broken to pieces as soon as the circulation was interrupted. Later, when the circulation was restored, there was a granular current which disappeared as soon as the current was swift enough to prevent agglutination. He also cited clinical cases in which the same picture was present after traumatic section of the central artery of the retina. The same appearance can be produced in the living eye by pressure properly applied so as to diminish the quantity of

blood that enters and thereby the rapidity of the current. Then the phenomenon is seen best in the veins against the bright background of the papilla. First comes the appearance as of rapidly flowing sand, then, with increased pressure, slowly flowing pieces and single cylinders. Then sometimes the proximal ends of the veins look like broad white bands into which the agglutinated red blood corpuscles disappear. The only explanation of this is that at this place the lumen of the vein has been reduced by the pressure to a very small slit, through which the blood flows very swiftly in a very thin and ophthalmoscopically invisible layer. With still greater pressure, the granular current may be produced in the centrifugal current of the arteries, which, under yet greater pressure, may turn and flow centripetally, when the blood may be pressed out of the entire retinal vascular system. Meyerhofer observed a similar condition in his case of embolism.

It is easily understood that agglutination takes place first in the veins, because the current is slower in them than in the relatively smaller arteries, through each of which the same quantity of blood flows in the same time. On the other hand, cases in which the granular current occurs in a single artery while the corresponding vein shows an uninterrupted blood column, can be explained by the consideration that the territories of the larger arterial and venous branches do not exactly correspond, that the vein in question contains not only the slowly flowing blood from the artery with the granular current, but also rapidly flowing blood from other arterial branches, and that the movement of the mixture is sufficiently swift to prevent agglutination. The ease with which a granular current may be obtained by pressure on the eyeball differs in different persons. It is greatest in very anæmic persons, perhaps because the diminution in the number of red blood corpuscles allows the phenomenon to become visible more quickly, perhaps because in them the red blood corpuscles possess greater power of agglutination.

The conclusion I draw from what has preceded is that circulation is present as long as the thread of blood in its course toward the periphery is not broken to pieces, or the red



blood corpuscles agglutinated, no matter how thin it may be, or how covered in places by thickening or opacity of the vessel walls. It may be possible to form an estimate of its swiftness from observation of the granular current in other cases. A complete interruption of the blood stream can be assumed only when the blood column is broken and the separated portions stand still. The absence of pulsation, either spontaneously or on pressure, is no sign that circulation is not present.

If we accept the view of Donders, that pulsation in the veins is due to the fluctuating tension caused by the pulsating entrance of arterial blood into the eye, the impossibility of obtaining it by pressure is only a sign that the quantity of blood which enters the eye with each systole of the heart is so small that it cannot produce a visible compression of the ends of the veins when they are normal. On the other hand, the theory of Donders, or of Coccus, as opposed to that of Helfreich, is supported by the fact that in many cases of so-called embolism, in which there was a marked narrowing of the lumen of the artery, a spontaneous or artificial venous pulse was at first absent, but later was re-established when the diminution of the obstacle permitted the passage of more blood, for the blood must escape normally from the veins if they appear to be normally filled.

Pulsation on pressure in arteries of normal calibre shows that there is no marked obstacle in their lumen, for if the calibre is constricted at a certain point the pulsation will appear on its proximal side, unless the walls are too rigid, but the diminished quantity of blood driven by the obstruction will be unable to distend visibly the walls on the distal side. If, however, the lumen at the constricted place should become enlarged in the course of time, a sufficient quantity of blood might be able to pass through to produce a visible distal pulsation with each systole. This same theory may also account for the pulsating movements of the arteries which can frequently be seen in healthy persons when sharp bends are present in the arteries normally and physiologically. The application of these theoretical considerations cannot be exemplified from literature, and the arterial pulse from



pressure is influenced by many other factors than the presence of an obstacle to the circulation.

It is important to take into consideration the behavior of the vessels, especially of the arteries, in order to correctly interpret the clinical picture of so-called embolism. Without exception, there is a diminution in the size of the arteries, particularly marked on the papilla and in its neighborhood, while the peripheral parts are larger. This general diminution in size of the vessels is due in part to the lessened supply of blood, but as regards other factors there are two views. Fischer thinks that after the circulation has been interrupted the blood pressure falls below the intraocular pressure, and so the blood is pressed out, while Elschnig thinks that the elastic contraction of the arterial walls expels the blood as soon as its strength exceeds that of the blood pressure. I believe both factors take part.

The fact that the larger arteries are often so remarkably small at their beginnings, Elschnig ascribes to a contraction of their walls caused by the ischæmia, and he takes the ground that the strength of the musculature of the larger arteries suffices to empty them, while in the smaller it is insufficient to do so. Without regard to the fact that ischæmia is commonly supposed to dilate arteries, I think that the musculature of the vessels is proportioned to their size, and that the weaker muscle produces the same effect on the small vessel that the stronger does on the large. Electric irritation causes the vessels to contract evenly throughout their ramifications, at least in rabbits. It is much more likely that the great diminution in size of the proximal parts of the arterial blood columns depends on arterio-sclerotic changes in the walls, an evidence of which is the fact that the wall can often be seen as a gray cord of the proper size of the artery, with a small thread of blood in its middle, while in contraction of the artery the entire cord would appear reduced in size. A normal external contour of the vessel can often be made out when the calibre appears to be unevenly constricted.

Raehlmann says that the healthy wall of a retinal vessel filled with blood cannot be seen and differentiated from the

surrounding tissue as long as the retina is healthy. This rule is not without exception, for in many cases normal vessels in a healthy retina reflect so much light that with a plane mirror and weak illumination a faint gray glimmer along one margin of a vessel can be seen, which must be a reflex from its wall. I have sometimes seen under the conditions mentioned by Raehlmann a fine gray stripe, usually on both sides of the larger vessels, which I believe to be not a reflex but the vessel wall itself, made visible on the sides by the formation of a thicker layer than appears elsewhere. Schneller has also claimed that the walls of a vessel can be seen when it crosses a dark background, such as is formed by another vessel.

When the blood stream is absent, the vessels are easily to be seen. Schnabel and Sachs state that after death the vessels in the papilla appear as light threads. In spontaneous and artificially produced arterial and venous pulsation the empty vessel walls are visible as bright bands, but this appearance must be differentiated from that caused by arterio-sclerotic thickenings of the walls, and also from that caused by the filling of the vessel with plasma, both of which produce the appearance of round cords.

Diseases of the vessel walls make themselves visible chiefly in two ways, as white sheaths from perivasculitis, and as more or less irregular constrictions of the calibre of the blood column, in which the etiological thickening of the wall cannot always be recognized with certainty. A uniform narrowing of calibre is found chiefly in chronic degenerative processes, particularly in retinitis pigmentosa. In these cases, with a plane mirror and reduced illumination the walls can often be seen as abnormally thick, light gray stripes on each side of the blood column.

The ophthalmoscopically visible changes from arterio- and phlebo-sclerosis have been well described by Raehlmann. The symptoms which interest us the most are those dependent on proliferations of the intima of the arteries, which can be recognized through constriction of the blood column while the outer contour of the vessel remains of its normal calibre. These constrictions are most distinctly to be

seen from the entrance of the vessels to about one papillary diameter into the retina, usually diminishing in intensity. How far they extend proximally can be determined only with the microscope, and very few such examinations have been made. Sometimes the thickenings of the walls are uniform for long distances, more frequently they extend for short distances and are not uniform. The blood column which has been constricted to a thin thread, often suddenly resumes its normal calibre, expanding so as to form a cone. When the normal places in the vessels are of short extent, peculiar spindles are formed which have often been mistaken for aneurysms. In other cases, the thickening of the walls extends in varying degrees for long distances, so that the blood column, diminished on the whole, has a peculiar irregular appearance, while more peripherally it is of normal calibre.

The thickenings of the walls are not always demonstrable. They are to be seen most easily with a plane mirror with reduced illumination, or by looking at the vessels in the margin of the cone of light, where they are to be seen by means of the light reflected from the posterior layer, when it appears as a gray or grayish-yellow cloudiness. In other cases, it has a bright gray, translucent, or grayish-white color and is very easily seen. In such cases, the thickening of the walls is very marked, so that that portion of the vessel appears as a solid, bloodless cord. But it has been demonstrated that blood can circulate through these places, and it is accepted as certain that it does so when there is no stasis on the proximal side of the place in question. In regard to this, Raehlmann says that sometimes the affection is developed highly at the entrance of the vessels, in which case the principal arterial stems run into a gray mantle, from which they emerge suddenly and greatly thinned. The visibility of the thickening of the intima depends chiefly on the stage of development: it is transparent in the progressive stages, but becomes more opaque as the regressive changes progress.

The same vascular changes are observed in the so-called embolism of the retinal vessels, a fact which struck Raehlmann also, who says that one often finds the same condition



of the vessels after embolism of the central artery, and also that when years before he saw for the first time such a condition he thought he was looking at the remains of the embolism.

The arteries are described usually as much diminished in size, threadlike or invisible on the papilla and for a distance into the retina, and better filled in the peripheral parts. Irregular constrictions of the calibre have been described in some cases; more rarely the presence of a gray sheath as broad as the normal vessel, with a small central thread of blood, has been mentioned. This is partly because it is difficult to see these changes, partly because immediately after the attack the retina and papilla are rendered opaque by the more or less extensive necrosis of the nervous elements, and the vessels are thus hidden. If more attention is directed hereafter to these changes, they will be found more frequently, especially some time after the attack, when the opacity of the tissues has passed away. The limited localization and the form of these changes are sufficient evidence against the view of Elschnig that they are the expression of the nutritive disturbance of the vessel walls caused by anæmia, as well as Fischer's idea that they depend on the endothelial lining of the vessel wall.

Such arterio-sclerotic thickenings of the walls in embolism of the central artery have been described by many authors, but they have been found much more often in the so-called embolism of the branches, because the affected part lies in the clearer retina, and the contrast with the normal lumen is more striking. The vascular changes which take place when the circulation is first interrupted are followed after a time by secondary conditions which are in part due to an extension of the arterio-sclerosis and in part to a uniform diminution of calibre from functional adaptation, such as is seen in atrophy of other organs.

The tapering off of the veins, which is often conspicuous, may be due either to a phlebo-sclerosis, or, when it occurs in the papilla, it may be a normal appearance caused by the oblique passage of the vessel into the substance of the papilla. This appearance is often found associated with a



venous pulse at the entrance of the vessels, which is due to the same anatomically inclined position.

As has just been said, there are only three possibilities which can produce this clinical picture—embolism, thrombosis, and endarteritis proliferans, and as positive proof cannot be brought forward in favor of either one it is necessary to consider which can best explain all the symptoms.

The theory that thrombosis of the central artery is the cause of the interruption of the circulation was propounded by English authors and has found adherents in England and America. A clear differentiation must be made between the benign thrombus which follows a spontaneous degenerative change in the wall, and the toxic thrombus which appears in vessels in inflamed tissues. The latter certainly causes the sudden blindness in orbital phlegmon, with fundus changes which resemble the clinical picture of embolism, but this condition can easily be differentiated by the presence of other symptoms. The benign form of thrombus may be due to a degenerative disease of the inner wall of the vessel which causes loss of endothelium, or to a retardation of the blood stream. But while arterio-sclerosis of the larger vessels involves all the layers of the walls and destroys more or less of the inner wall so as to make a rough surface favorable for the formation of a thrombus, in the smaller arteries it usually takes the form of endarteritis proliferans, which is less apt to destroy the endothelium. This accords also with the nutritive conditions of the vessel walls, which are more favorable in the small vessels than in the large. But if no abrasion of the endothelium is present the formation of a thrombus will be difficult, particularly as the blood will be driven with increased swiftness through the narrowed place. Cohnheim says that it is an undoubted fact in human pathology that thrombi are never formed in vessels under a certain size, not even under conditions which favor coagulation of the blood during life and have at the same time caused them in larger vessels. How then does the clinical picture agree with the theory of thrombosis?

I agree with Mauthner that a complete interruption of the circulation takes place and lasts for a shorter or longer

time, in order to cause the sudden blindness and the partial necrosis of the retina from ischæmia. I can add to the reasons given by him that sometimes in cases of so-called embolism a slight improvement, or at least no further impairment, of vision is observed when the blood supply is very slight, as shown by the presence of a granular current, or by the very small calibre of the threads of blood enclosed in gray mantles which form the papillary or retinal arteries. Thus Raehlmann's case of great arterio-sclerotic thickening of the walls of the retinal arteries without defect in the visual field shows that a very small supply of blood will suffice to preserve the function of the retina. But it is certain that in almost all cases circulation is restored soon after the attack. If now the closure was thrombotic, there would be the greatest probability that the thrombus would extend proximally and distally, would become firmer, and would cause permanent total blindness with stasis in the retinal vessels. To explain how the circulation can be restored so soon after an attack, one must assume the theory of a canalization of the thrombus, or that of the formation of a collateral circulation. Canalization needs some time for its development so that total blindness would result in spite of it, and stasis would be met with because many cases are seen at an early stage. The possibility of the formation of a collateral circulation has been denied by competent investigators. The retinal vascular system is so isolated embryologically within the papilla that communication with the choroidal vessels is out of the question. It can then be formed only by the anastomosis of the branches of the central artery with Zinn's vascular circle. But Leber states that the anastomosing vessels are of very small size, little if any larger than capillaries. Collateral circulation could be developed but slowly through vessels of such size, while in the so-called embolism the vessels are pretty well filled again in a short time. The presence of the cilio-retinal vessels and of branches given off very early from the central artery is unimportant in this connection, because the retinal arteries do not anastomose.

How can the binocular attacks of different severity, the

prodromata, or the attacks which pass off without serious damage be explained by the theory of thrombosis? The cases in which a very slow granular blood stream can be seen coming out of the central artery, and in which a very small remnant of the lumen can be seen to be present, are particularly difficult to understand. It must be assumed that if there is a little canal remaining in the thrombus it will soon be stopped up by coagulated blood clinging to its rough surface. The impossibility of the theory of canalization is to be seen most clearly in those cases in which soon after the attack the blood column is greatly constricted for shorter or longer distances. Equally obscure are the cases in which for days at a time a granular current will alternate with an uninterrupted blood column, which shows that the movement of the blood is at times slower, at times faster, while the lumen at the place of obstruction is sometimes narrower than at others. Were the arterio-sclerotic thickenings of the walls which were seen in many cases purely coincidental? If this theory is right, a gradual change in the color of the thrombus from dark red to gray should sometimes have been observed.

The view which has been hitherto generally accepted is that the interruption of the circulation is due to embolism. But there is the same great difficulty in the explanation of the re-establishment of the circulation so soon after the attack. As total interruption of the blood stream must follow an ordinary embolism, and as this is not usually the case, the theory of an incomplete embolism has been propounded. According to this, the corners of an embolus of irregular form impinge on the walls of the vessel and the blood rushes by its margins, instead of its being driven forward by the force of the blood stream, until it completely fills the lumen. I think that such an embolus, which can be conceived of only as calcareous, is very rare. Emboli are formed from pieces broken from thrombi or atheromatous ulcers, both of which possess a fairly firm consistence. But as to the physical retention of a fissured body in the strong current of the vascular system, I believe with Mauthner and Leber that it will be driven as far forward as possible by the



strong current, that when the lumen becomes too narrow it becomes wedged in, and that its unevennesses are readily pressed into the distensible vessel walls. The only exception to this rule is when an embolus comes to rest at the point of division of a vessel, but even then it will usually close one of the branches. Elschnig tacitly admits this in his theory that where the embolus grazed the vessel wall a contraction of the latter was occasioned, which held it fast. It would then adhere so firmly to the intima that when the contraction was relaxed it would remain attached to the wall and allow the blood to again circulate. But unless it remains permanently fixed at this place the blood stream will crumble and loosen it and drive it farther on. If this theory is accepted as possible, it must be expected that as soon as the lumen widens a little the embolus will be carried forward in a mass until it is arrested in another place. I believe it to be impossible that an embolus can remain fixed to the wall of an artery, unless arrested by a projection from the wall or by becoming wedged in the mouth of a little branch. At the very first an embolus might turn, but this would allow the passage of a little blood for only a few seconds, because it would be driven at once as far forward as possible. Leber adds that increased obstruction through the formation of a thrombus, for which the rough surface of the embolus gives abundant opportunity, is to be expected rather than the opposite, a view with which Schnabel and Sachs coincide. The possibilities suggested by von Wagenmann, that the obstruction may be reduced in size by compression on the part of the vessel, or by a contraction on its own part so as to free a part of the lumen, or that the vessel may become dilated as the result of ischæmic paralysis, can bring about only the same conditions as would result from a relaxation of a contraction of the walls. A breaking up into minute particles, as suggested by Fischer, is scarcely conceivable on account of the general nature of emboli. If such particles should be unable to pass through the capillaries, they would cause many emboli of the smaller branches which could be plainly seen. Mauthner tried to explain the cases he met with by the theory that an embolus which



partly occluded the commencement of the central artery of the retina at the place of its separation from the ophthalmic artery was torn away after a short time by the blood stream. If this can occur, it must be with the greatest rarity. The rest of the symptoms remain unexplained, the same as with thrombosis, and Kern has shown that the source whence the embolus comes often cannot be demonstrated.

Among so many cases of this kind as have been observed, it would be a natural expectation that the embolus would have been seen frequently, but scarcely one of the pictures of supposed emboli can stand critical examination.

(Abstracts of the ophthalmoscopical appearances as described by different authors in twenty-two cases are omitted here from lack of space.)

Criticism of the descriptions given by various writers is difficult and uncertain, partly because they are brief and inexact, partly, perhaps, because they are subjectively colored by the desire to see the embolus. Greater clearness can be obtained in the future if more attention is directed to the condition of the vascular walls, especially if careful differentiation is made between ischæmic diminution, filling of the normal calibre with plasma, and arterio-sclerotic changes in the walls, the last of which may vary from a simple narrowing of the calibre of the vessel, with a not always demonstrable thickening of the walls, to its metamorphosis into a white cord of corresponding calibre, in the midst of which a canal may exist without any red blood being visible. In several cases the supposed emboli are described as having the appearance of white scales resting on the arteries, through which sometimes the red blood column could be seen. Whether these white spots were indicative of arterio-sclerosis, small extravasations, or membranes of connective tissue, cannot be told, but at any rate they were not emboli. In a few cases, short swellings of the arteries were pronounced emboli, while the vessel more centrally or more peripherally was pictured as more or less thinned. It is conceivable that these swellings were ectasiæ, or perhaps places of normal calibre in vessels whose walls were for the most part thickened by arterio-sclerosis. It is difficult to

understand how the fundus regains its normal appearance after a short time. Mules asks in regard to his case: "Why was the clot dead white and so easily dispersed? Where did it go?" In another case, the superior and inferior arteries of the papilla and the commencement of their branches are described as uniformly filled with a mass the distal ends of which were not sharply defined, and yet there was no stasis, and amaurosis was incomplete. Finally there remained of this mass only a long gray thread in the superior, and a similar one in the inferior, temporal artery. It is impossible that a fibrinous coagulum or an atheromatous mass should form so uniform an effusion, produce no stasis, and result in incomplete amaurosis. In one case, the statement that the artery was bloodless for a distance behind the embolus, awakens doubt as to the accuracy of the observation. Was arterio-sclerosis with the lumen of the vessel filled with plasma mistaken for bloodlessness? If so, perhaps the dark red plug was only the sign of a narrowed place in the vessel. After seven days, the embolus had changed its position. In other cases, the description is indicative of embolism, but too brief to be convincing.

In the picture of an embolus fixed in a vessel, one would expect to see it enclosed both distally and proximally by two points from the blood column, which would differ from it somewhat in color at least. We should also expect to see peripherally the blood column broken up into granules, but such a picture is not to be found among all the descriptions of supposed emboli. On the contrary, there has often been described a conical pointing of the blood column at each end of the place of obstruction, a condition which indicates a narrowing of the lumen through thickening of the walls.

(The reader is now referred to the writings of eighteen authors with regard to the conditions found by them microscopically.)

It is difficult to criticise these writings, because several of the observations were made before microscopical technique and histology had attained the modern standard, and because even at the present time certain pathological questions of importance in this connection have not yet been satisfac-

torily settled. Perhaps the differential diagnosis between an organized embolus, thrombus, and primary endarteritis proliferans cannot be made always with certainty, particularly in the later stages. All layers of the walls take part in the organization of emboli or thrombi in the large vessels, and there are always present vessels which grow out from the vasa vasorum through the adventitia and muscularis into the foreign body. Yet it might be possible, though improbable, that in the small vessels which have no vasa vasorum organization could take place from the intima alone, the adventitia and muscularis remaining intact, and in that case the difficulty of differentiation between primary and secondary endarteritis would be much greater. But we certainly have the right to exclude cases in which changes in the entire wall, not simply of the intima, as well as changes of the foreign body have not been described, although sufficient time for their development had elapsed between the attack and the enucleation of the eye, as not having been satisfactorily observed.

In some cases no emboli were found, but this does not prove the absence of such a lesion, because, as Hirschberg pointed out, the entire course of a vessel can never be accurately examined. I cannot believe that an embolus and its organized mass can completely disappear and leave no trace, as Elschnig suggests, and in two of the cases at any rate the time was much too short for this to occur. But it is well known that endarteritis proliferans often is confined to short distances.

Certain other cases have to be excluded from consideration because of lack of histological unity, non-recognition of post-mortem changes, or too brief and imperfect descriptions. In some cases it is questionable whether finely granular unorganized masses in the vessels, not associated with lesions of the intima or endothelium, were not post-mortem coagula rather than emboli, while in some the thickenings of the vascular walls suggest endarteritis proliferans. Priestley Smith and Ridley describe cases in which the lumen of the central artery of the retina was filled with an organized mass, the fibrillæ of which were arranged con-



centrically. Neither mentions any further change in the other layers of the walls of the vessels. This fact, together with the concentric arrangement of the fibres, renders the diagnosis of endarteritis proliferans or obliterans the more probable. The similarity of the concentric arrangement to that of blood clots, which Ridley cites, is only superficial; as the organization of a thrombus, or of an embolus, takes place more or less irregularly from the periphery, the extension of the tissue will assume a more radiating and therefore more irregular character. The fact that in these cases perception of light was present up to the last argues against thrombosis and in favor of endarteritis proliferans. Ridley himself says that the changes in the walls of the vessels were characteristic of endarteritis obliterans rather than of atheroma. The patient had renal disease also, which he thought to be the cause of the vascular trouble, but I believe it to be more probable that the renal disease was the result of the arterio-sclerosis.

Schnabel and Sachs found what they took to be an embolus adherent to the wall, but the description—"A hyaline, partly granular plug, without cellular elements, covered with two or three layers of epithelium"—shows a very slightly developed organization for an embolus three months old, and is not convincing that the condition was one of embolism.

Neither the description nor the illustrations of Elschnig's case indicate positively that it was one of an embolus six weeks old clinging to the wall of the artery. In one drawing, the intima is thickened in its entire circumference, but much more so on one side, which was taken to be the seat of the embolus. Elschnig thought that the swelling of the intima had filled out the angles of the embolus, but this does not account for the thickening of the opposite wall. At places, a certain concentric arrangement of the tissues can be seen. In the other drawing, the endothelium seems to have been sketched in schematically, but even so the picture of the superior papillary artery suggests something else than an embolus. It is an important fact that Elschnig found more or less arterio-sclerosis in the retinal arteries, some



branches obliterated, others with their lumen narrowed to small slits, others showing only a little thickening of the intima, these changes frequently extending for short distances. He thought the changes were due to interference with the nutrition of the vascular walls through the temporary ischæmia ; but with so great a difference in magnitude, and their usual confinement to short distances after such a brief lapse of time, they may be interpreted with greater propriety as evidences of a general primary arterio-sclerosis.

With more certainty, I believe Wagenmann's case to have been one of endarteritis proliferans. This seems to me to be indicated both by the illustration, with the concentric arrangement of the tissue elements, and by the description. He says that a little slit-shaped lumen could be seen lying not only excentrically along the wall (unilateral proliferation of the intima), but also in places within the embolus (concentric proliferation). The lumen was surrounded by many layers of endothelium. If the vessel was followed from its entrance in the optic nerve, it could be seen to be considerably narrowed by the concentric proliferation of the cells of the intima up to the site of the embolus. The same condition was found peripherally from the embolus. The apparent dilatation of the arteries, which he mentions, may be ascribed to the fact that, where the arterio-sclerotic thickenings had taken place, the walls of the vessels could not contract *post mortem* as much as in the uninvolved portions. Wagenmann also found in all the retinal arteries more or less marked proliferation of the intima, sufficient to obliterate some of the small branches, which, as in Elschnig's case, was of arterio-sclerotic nature.

The description given by Nuel might be reckoned as one of an embolus in the process of organization, but it is striking that the second subdivision of the central artery is so much narrowed in the papilla and for some distance into the retina that its lumen sometimes seems to be wanting. In the retinal arteries also the lumen is much narrowed by thickening of the walls, evidently endarteritis proliferans. The description that there was a proliferation of the endothelium of the central vein, while the blood column which

filled the vein was divided into islets, is not clear to me. It suggests a thrombus in process of organization, but Nuel states that no thrombus was present. Yet under these circumstances the circulation which was present in the retinal vessels and caused numerous hemorrhages and venous stasis cannot be understood. Nuel ascribed it to a collateral circulation through the capillaries, as he could find no larger vessels through which it might be formed. Marple describes the embolus examined by him as a hyaline body which is stained by hæmatoxyline, contains some granules,—which may perhaps have wandered in,—and can be plainly distinguished from the wall. Red blood corpuscles lay distally and proximally. The intima was hypertrophied, the nuclei multiplied. Sections of the optic nerve showed that the walls of the central artery were thickened proximally through proliferation of the intima, which increased more and more until the vessel was completely filled. At this place the diameter of the vessel was greater than in normal places. Farther back the proliferation of the intima gradually decreased. Marple took this mass to be an organized thrombus, though he freely says it was difficult to distinguish the hypertrophic intima from the tissue of the thrombus. I think there are several grounds on which to base the belief that this was a case of endarteritis proliferans: the gradual increase in the thickening of the intima both distally and proximally, the absence of blood pigment so soon after the formation of a thrombus, the absence of reactive changes in the muscularis and adventitia, the concentric arrangement of the tissue, and the long slit-shaped space in the mass, which could not be a newly formed vessel, but was much more probably the remains of the lumen left by the endarteritic thickening of the walls. If the more distal structure was an embolus, it is strange that the thrombus did not attach itself thereto, as it furnished a most favorable opportunity, but I do not think it was an embolus. I think it was something that had no causal relation to the blindness,—perhaps a thick clot of blood plasma with some leucocytes,—for it cannot be conceived that the secondary thrombus should become so highly organized, while the embolus should

experience no change at all and cause no irritation on the part of the intima of the vessels, as the proliferation of the intima and the multiplication of the nuclei at this place appear to be analogous to the spontaneous thickening of the intima found farther back. Even if one supposes it to have been a chalky embolus, it must at least have become covered, not to mention that chalky masses cannot usually be cut without trouble with the microtome, and one would hardly expect that a chalky body, which is very hard, would be carried so high in the vascular system.

The case of retinitis hemorrhagica formerly described by me, and, as I think, one of Wagenmann's cases, were instances of similar temporary occlusion of the central artery of the retina by endarteritis proliferans. In an eye which had been blinded two months before by hemorrhagic retinitis and had been enucleated on account of glaucoma, there was found marked thickening of the intima of the central artery of the retina, which had greatly narrowed its lumen. Small arteries and veins were obliterated in many places in the retina. The non-obstructive thrombus in the central vein, the histological nature of which is still doubtful, could hardly have caused the blindness.

If we now review each case, bearing in mind all the points hitherto discussed separately, we must admit that in not one are all demands so perfectly met as to form a convincing argument in favor of embolism or thrombosis.

Three years ago, I had an opportunity to observe a case of so-called embolism of a branch in which it was clearly evident, from the peculiar change in the artery at the place where the retinal opacity began, that the lesion was not an embolus, but a marked narrowing of the lumen of the vessel from thickening of its walls. In a case of hemorrhagic retinitis, which I examined microscopically, I found a high degree of endarteritis proliferans in the central artery of the retina, and this made clear the mechanism of the production of the symptoms of so-called embolism. I will now give, partially abbreviated, the clinical histories of three cases of so-called embolism, the third of which came under treatment only a short while ago.



1. Mrs. J., thirty-two years old, came under observation Feb. 22, 1896. Patient stated that on Feb. 18th a shadow suddenly appeared without external cause before the right eye in the inner and upper part of the field. She had had acute articular rheumatism twice and for some years had had palpitation of the heart after climbing stairs. Health otherwise good. Married eleven years; three healthy children.

The blood column of the right inferior temporal artery on the papilla suddenly passed through a short stretch of great narrowness, so that it could be seen only as a delicate red line which spread out in a conical form at each end. The normal outer contour of the wall was visible as a fine haziness against the red background. Pressure on the eye produced pulsation in the normal central portion of the artery, as well as in the nasal inferior artery, which branched off before the narrowing commenced, but not in its distal portion. Peripherally from the constriction the artery and its branches regained an almost normal calibre. In the region supplied by the inferior temporal artery was a typical cream-colored cloudiness of the retina. Scotoma in the upper-inner sector of the field. Lungs normal. No glandular swellings or eruption on the body. Over the apex of the heart a loud systolic murmur, the second sound accentuated. Cardiac dulness extended somewhat to the right. Apex beat strong.

*Treatment.*—Massage and sodium salicylate *gm* 0.5 twice a day.

*Feb. 24th.*—The blood column at the place of constriction appeared thicker. Pressure on the eye caused the artery to pulsate on the distal side of the constricted place.

*Feb. 27th.*—The constriction had become still more dilated.

*Feb. 28th.*—The constriction had almost disappeared.

*March 13th.*—There remained only a faint cloudiness of the affected portion of the retina with white shining dots. The formerly constricted portion of the inferior temporal artery appeared as good as normal, so that no trace of the disease could be seen aside from a greater glistening than normal of the wall on the nasal side. Fields, taken Feb. 22, March 3 and 18, showed a gradual diminution of the scotoma.

*Aug. 27, 1898.*—The inferior papillary artery was about half as thick as the superior papillary artery. Its nasal and temporal branches were for a distance smaller than the corresponding branches of the superior artery, but more peripherally they again



became normal. For a distance of three fourths of the diameter of the optic disc, at the place of the former constriction, the inferior temporal artery possessed a delicate, clear, silver-gray mantle of the same calibre as that of the column of blood in the corresponding part of the superior temporal artery, which faded away at each end. For about four diameters of the optic disc farther, the inferior temporal artery was smaller than would be expected, and smaller than the corresponding part of the superior temporal artery. The blood column did not exhibit its normal uniformity, but showed little, irregular, short bends in its contour, thus causing dark places. In the inverted image it was noticeable that this part was considerably less visible than the peripheral parts, which in the upright image appeared uniformly normal. In the central part of the formerly affected portion there was a very delicate, smoky haze of the retina, with a considerable number of very fine white dots.

Vision of each eye,  $\frac{5}{8}$ ; with cylindric correction,  $\frac{6}{8}$ .

2. Mrs. B., forty-eight years old. Came under observation Jan. 11, 1898.

Several months ago a darkness came suddenly before the right eye. The vision improved again, but a more accurate statement cannot be made because the patient gave the matter no great attention. Yesterday evening everything again appeared to her as if the right eye was veiled. After going to bed she seemed to see in the darkness many golden rays with the right eye. On the previous day she had been much fatigued by a long walk. This morning she closed her left eye and found she could see nothing with the right. Has always been in good health, except that when fatigued she has often had palpitation and oppression of the heart. Two healthy children. Menses lately irregular and of long duration, probably climacteric. No symptoms of syphilis.

Uniform hypertrophy of the left ventricle, heart sounds clear except that when the patient is agitated there is a cracked first sound over the apex and left ventricle (Professor Eichhorst). No pathologically enlarged lymph glands, lungs normal, radial arteries uniformly rigid; pulse hard, 100. Urinalysis showed 0.75 per cent. albumin, no sugar, a few hyaline casts, epithelium, and leucocytes; sp. gr., 1.011, daily quantity about 2000ccm.

Both eyes externally normal, media clear. Vision of right, some perception of light to the extreme temporal side alone; of left,  $\frac{5}{8}$ .

Left eye normal. The veins were unusually branching on the

papilla and showed a remarkable physiological tortuosity, particularly two convolutions made by a branch of the superior papillary vein on the disc.

The right pupil was of normal size, reacted consensually in a normal manner, but did not react directly. The fundus showed the typical whitish opacity of the retina of the so-called embolism of the central artery, with radiating stripes about the disc and very dense in the region of the macula. In the midst of the latter appeared a red, round spot, the margins of which were sharply defined above, but not below, with the central normal reflex of the fovea. The vessels were sharply cut by the retinal opacity, into which many of them disappeared. The papilla was reddened, with margins which could be obscurely seen below and above but not on the nasal side, and with a central, funnel-shaped physiological excavation which extended to the temporal margin. The vessels on the papilla formed a picture of separate, short, dark red stumps, which was at first unintelligible, but later, when the cloudiness had subsided, were made out to be the superficial portions of an extraordinarily tortuous vein, the deeper portions of which were hidden by the opacity. This tortuosity of the superior papillary vein was physiological, corresponding to that of the single venous branch on the papilla of the left eye. In the upper temporal quadrant of the disc were several very fine tortuous vessels which extended a short distance into the retina, and some fine linear hemorrhages. The veins, to anticipate the clearing up of the short vascular stumps, could nearly all be traced to the entrance of the vessels, and all exhibited a centripetal granular current. This was swiftest and most finely granular, like flowing sand, in the inferior temporal vein, which was the largest, less swift in the median inferior vein, in which could be seen the separation of the blood into short red and yellow cylinders of variable size, with peculiar, sharp, irregularly notched lines of demarcation, resembling fracture lines of cast-iron. In the inferior nasal vein the movement was still slower. The current in the superior nasal vein was also slow. In the superior temporal vein it was so slow that long stretches of red and bright yellow color were formed, and the cylinders sometimes stood quite still, or pulsated back and forth, either standing still on the whole or gradually working toward the papilla. The rapidity of the movement in the veins varied somewhat within narrow limits.

The inferior temporal artery could be traced into the funnel-

shaped excavation where it became veiled. The inferior nasal artery first became visible about a papillary diameter from the margin of the optic disc. In both the blood columns were uninterrupted. The superior temporal artery appeared first about two papillary diameters from the margin of the disc, and in places its course could be traced as a bright band. More peripherally it showed a very slow centrifugal granular current. Sometimes for several seconds this vessel would contain only plasma for a distance of from one to two papillary diameters, so it looked like a bright yellow streak, and then would come a cylinder of agglutinated red blood corpuscles. In the superior nasal artery, which became visible about three papillary diameters from the margin of the papilla, there was a uniformly swift, centrifugal, granular current. About half a papillary diameter from the nasal margin of the papilla, a little artery emerged, which had a very irregular, greatly constricted calibre, through which ran a rapid, centrifugal, granular current. The smaller arterial branches, especially in the region of the macula, had a strikingly dark color, so they could not be distinguished from the venous branches. The constricted portions of the arteries, where the reflexes were lost, were also of a darker color than normal. The circulation was slower in the veins than in the corresponding arteries.

The peripheral portions of the vessels, which were perfectly visible, were only moderately smaller than would normally be expected from comparison with the corresponding vessels in the other eye. Quite to the temporal side there was a group of small hemorrhages. Downward and outward in the extreme periphery was a small atrophic choroidal patch.

*Treatment.*—Diet for nephritis. Tr. digit., ten drops t. i. d. Massage.

*Jan. 12th.*—In the inferior temporal vein was a fixed blood column, no granular current, and in the inferior nasal and median veins the granular current was more rapid. Otherwise the condition remained the same.

*Jan. 13th.*—The retinal opacity had increased and the central red spot formed a more striking contrast. The thickness of the retina could almost be determined by the parallax motion in the boundary zone of the little white dots which by their aggregation formed the retinal opacity. At the same time it could be seen that the red of the central spot was situated quite deeply, and that it presented a fine golden speckling, which is normal



and is caused by the united action of the pigment epithelium and the capillaries of the choroid.

*Fan. 14th.*—In the retinal opacity below the macula, dark areas could be seen along the vessels, such as are described by Nettleship. A rapid granular current was still present in the inferior and superior nasal veins alone. In the superior temporal vein was a very slow current with great agglutination of the cellular elements, which sometimes stood still and sometimes pulsated back and forth.

In the superior temporal artery the current was very slow, but varied a little in swiftness. This artery divided about three papillary diameters from the margin of the optic disc, one branch going upward and outward, the other upward. In the more horizontal branch the current came to a standstill, then after a while a pulsating movement began, by which the cylinders were pushed gradually backward to the point of division, where they were drawn up the vertical branch in the stream of plasma which filled it for long distances. A singular but very clear picture was formed as the red cylinders which occupied the full diameter of the horizontal branch were broken into little pieces as soon as they emerged, were impelled in an arch toward the nasal wall, rebounded, were carried up the vertical branch, and gradually united to form cylinders which occupied the full diameter of the vessel, separated by cylinders of plasma. After a time, a normally directed very slow granular current recommenced in the horizontal branch, again it came to a standstill, and again turned backward. Exact observations as to the currents in the other vessels unfortunately could not be made, because the patient became tired, and after a long rest a slow granular current was present in both. Pressure on the eye caused the proximal parts of the veins to appear smaller, but did not induce either arterial or venous pulsation.

*Fan. 15th.*—There was a very slow current in the upper veins. In the horizontal branch of the superior temporal artery, the phenomenon of a backward flowing stream could be seen again.

*Fan. 17th.*—The dark areas in the retinal opacity described by Nettleship had disappeared. At some distance from the papilla, all of the arteries and veins seemed to be pretty well filled and no granular current could be seen. The superior temporal and nasal arteries, almost to the margin of the papilla, looked like small rather opaque bands of a bright color, which could be easily seen



against the red background, and contained fine central irregularly outlined threads of blood.

*Jan. 19th.*—The retinal opacity had plainly decreased and contained little bright-yellow shining spots, principally about the macula (cholesterin crystals?). Outside of these were many white dots, perhaps products of disintegration. Between the papilla and the macula was a hemorrhage one third the size of the papilla. The superior and inferior nasal arteries had white borders to about one papillary diameter from the margin of the papilla. The superior nasal artery was composed, at its beginning, of markedly constricted sections separated by short somewhat wider ones.

*Jan. 24th.*—There now remained only a little area of white retinal opacity situated to the nasal side and nasally upward from the macula, while the rest of the formerly opaque retina appeared as if delicately veiled. The cholesterin crystals had become more numerous, the cherry-red spot paler. A little above the macula was a fresh hemorrhage. The papilla was clearer and showed the paleness of atrophy. It was now evident that what had hitherto appeared like stumps of vessels were parts of a very tortuous superior vein. The inferior and superior papillary arteries could be clearly seen as rather transparent grayish-white cords, which were thicker than the blood columns of the corresponding arteries of the left eye. Their solid cord-like form was well shown by parallaxic movements with the upright image. In the outer half of their course on the papilla, fine central threads of blood, which became thicker more peripherally, could be seen. The inferior papillary artery divided into three branches, the first of which went off nasally in the form of a thin thread of blood, covered for about one diameter of the disc by a delicate gray mantle. The blood column in the temporal branch passed through a short thickening, in which another twig was given off downward, which was also much constricted by a thickening of the wall visible as a delicate gray mantle. The calibre was irregularly but much diminished for some distance, and then came a short spindle-shaped swelling, which presented the normal calibre, color, and central reflex of the vessel, then again a constricted portion, which broadened conically into the normal peripheral portion. About one and a half diameters of the disc from the margin of the papilla, a macular branch was given off, which first appeared as a yellowish-white cord with a scarcely discernible central thread of blood, but farther in it appeared normal.

Until after it had crossed the vein the superior temporal artery could be seen only obscurely as an irregularly attenuated red cord, bordered by a fine yellowish-white haze, which made the external contour of the thickened vessel wall almost plainly visible. More peripherally it was normal. The superior nasal artery formed for some distance an irregularly thick small red thread, with short spindle-shaped thickenings in places. The wall appeared as fine haze. Farther on the artery was normal. The median nasal artery had become considerably smaller, both in the constricted part at its beginning and in the formerly almost normal peripheral portion. About two papillary diameters from the margin of the papilla, it was a fine irregular red thread, invisible in places, with a hazy white border. The superior macular artery could now clearly be seen on the papilla and for about one papillary diameter from it as a thin grayish-white band, with a very fine central red thread of blood. More peripherally it was normal.

Vision, right eye, movements of the hand on the extreme temporal side at 20 cm; left eye,  $\frac{5}{6}$ .

*Jan. 25th.*—Condition the same.

*Jan. 27th.*—Very little haziness of the retina now remained; the cholesterin crystals had mostly, the white dots largely, disappeared. The veins had white margins, in part unilateral, when it seemed as if there was between the white margin and the blood column a very small clear interspace, otherwise their calibre was normal. If this interspace exists, does the opacity belong to the adventitia or to the lymph sheath?

*Feb. 8th.*—The retinal opacity had gone, but there still remained a diffuse fine gray veiling of the formerly opaque parts. In the macula there was perhaps more pigmentation than formerly, and the white dots were scattered about its neighborhood. The hemorrhages between the macula and the papilla had been absorbed. On this day, a week since the patient was last seen, a granular current could be seen again in all the vessels. In both the superior arteries, the current was very slow, with long stretches of plasma and short cylinders of red blood corpuscles. In the horizontal branch of the superior temporal artery, the phenomenon described above could be seen again. In the afternoon, the blood in the horizontal branch stood still for some time and then began slowly to flow centrifugally. The superior temporal vein looked like a grayish yellow band in which the sparse masses of agglutinated red blood corpuscles could be seen to sink slowly.

The patient could give no reason to account for this condition except that on the previous day she became very tired. She had been feeling very well. Menses five days ago. Ordered rest.

*Feb. 9th.*—Same condition as on Jan. 27th. No granular current. Pressure on the eye caused no arterial or venous pulse, but did diminish the proximal segments of the veins and even cause them to disappear, although it could not suppress the threads of blood in the arteries as long as the pressure was not greater than the patient could bear. In the left eye a hemorrhage was to be seen external to and below the papilla.

*Feb. 26th.*—Papilla more markedly pale and atrophic. The thread of blood in the inferior papillary artery broader and extended farther proximally.

*March 11th.*—In the left eye, there were seen a small fresh hemorrhage and two little silver-white spots with radiating margins a little below and between the macula and papilla. There was an irregular constriction of the blood column of the superior temporal artery for some distance pretty nearly above the macula.

*March 29th.*—In the left eye, the hemorrhage and one of the white spots had disappeared, while the other spot had become smaller.

In the right eye, there was a steam-like haziness of the retina over the region of the posterior pole and the macula was very finely pigmented. Both veins and arteries, but particularly the latter, were smaller than they should have been in their otherwise normal peripheral sections. The white margins of the veins, usually unilateral in places, extended from three to five papillary diameters from the margin of the disc and were more marked than formerly. The proximal sections of the arteries showed an increased thickness of the threads of blood, and the junction of both papillary arteries with the central artery could be seen. The superior temporal artery was almost invisible for about one papillary diameter on the other side of the macula, but more peripherally it again became normal. No arterial or venous pulse could be obtained by pressure, but a very hard pressure caused a slow granular current.

Vision, right, amaurosis ; left,  $\frac{5}{6}$ .

3. Mrs. H., sixty-four years old, came under observation July 1, 1898.

Patient had never been really sick, has borne six healthy children, and had no miscarriages. For the past three years has



often had swollen feet and eyelids, but these swellings went away of themselves after a little time. For the past three months her feet have been almost constantly swollen. She has often had palpitation of the heart after climbing stairs or other severe exertion, and has had frequent headaches since childhood.

Twelve days ago the patient noticed a shadow before the right eye for the entire day, which was worse on the following day. Eight days ago she accidentally learned that she could not see with the right eye, and the condition has remained the same ever since. She has not lately made any severe exertions.

Very pale, weakly woman. Radial and temporal arteries very rigid. Heart sounds clear. No cardiac hypertrophy. Pulse 90 to 100. Fairly marked œdema of feet and ankles. Eyelids slightly œdematous. Skin lax. Urinalysis; sp. gr., 1.009; daily quantity about 1100ccm.; albumin, 1%; a few hyaline casts, some round cells and pavement epithelium.

Both eyes were externally normal, the media clear.

Right eye. Over the entire region of the posterior pole there was an irregular yellowish-white opacity of the retina with radiating marks about the hazy papilla. The red spot in the macula did not present a strong contrast because the retinal opacity had begun to retrograde. The formation of the opacity by the coalescence of little white dots could be recognized in the boundary zone opposite the central red spot, by observation of the parallax motion of the dots on the more deeply lying red of the choroid. Between the macula and papilla were large thin irregular hemorrhages.

On the papilla the arteries resembled white cords with very fine threads of blood in the middle, visible only in the outer two thirds. As slightly larger threads, they extended for two or three papillary diameters into the retina and then their calibre became increased. Some short portions of the superior artery and its branches on the papilla remained normal, or were only slightly constricted, and gave rise to the appearance of short spindles. The thickened vessel wall could be seen as a gray mantle most plainly on the papilla, peripherally it became obscure and resembled a light border which was less red than the rest of the fundus. The inferior vein on the papilla and the beginnings of its branches were much constricted to about two papillary diameters into the retina. The blood column of the superior papillary vein was less constricted, but there was a marked constriction which affected



the blood column of its nasal branch somewhat more peripherally for the distance of about one and a half papillary diameters. Where the calibre of the veins was constricted, the blood column was enclosed in a gray sheath of rather greater thickness than would be expected in normal vessels, clearer and whiter than those of the arteries. In both arteries and veins, where the sheaths passed over into the normal contour of the vessels, the blood columns expanded conically. The calibre of the peripheral portions was only a little less than that of the corresponding vessels in the left eye. The inferior and superior temporal veins were much constricted where they crossed the arteries, without any thickening of the wall being visible. A granular current was present in all vessels, but no venous or arterial pulse could be obtained by pressure.

Left eye: The papilla was slightly reddened. There were some clear white spots, with diffusely radiated margins, about three fourths the size of the papilla, and some small hemorrhages in the fundus. The vessels were normal.

Vision, right, movements of the hand at 3cm; left,  $\frac{5}{8}$ .

*Treatment.*—Milk diet, rest in bed.

*July 3d.*—No granular current.

*July 29th.*—General condition better. Urinalysis, 0.75% albumin.

In the right eye, there remains only a little opacity of the retina in spots, mainly about the macula. The vessels were in about the same condition as before. Pressure on the eye produced no arterial or venous pulse, but did cause a granular current. The conditions present could not be studied with exactitude because the patient was very weak and irritable.

I have only a few words to add to these clinical histories. The quick retrogression of the obstruction is most striking in Case 1. It was evident that the obstruction was not an embolus, from the conically pointed blood column on each side, together with the normal outer contour of the walls. That it was not a thrombus is shown by the persistence of a central canal, as well as by the rapid and uniform retrogression, which in endarteritis proliferans can be understood, if it is assumed that the proliferation came from the posterior wall. In that case, after the retrogression the diameter of the canal would appear normal, although a constriction might

exist in the diameter perpendicular to the retina without being visible on account of its position.

That a retrogression of the endarteritic proliferation can take place is shown clearly in both of the arteries on the papilla in Case 2. At first only a fine thread of blood was visible in the outer part of the course of each, but later this thread became thicker and was visible to its junction with the central artery. The fact that a blood current was always present shows that an extremely small thread of blood existed all the time, but it could become visible only when the thickening of the wall retrogressed. In the same way, the threads of blood in the previously constricted proximal sections of the retinal arteries became thicker and retained a whitish margin which grew clearer. This was not a counterfeit appearance caused by the dwindling of the retinal cloudiness, because the retina had already lost its white opacity. It is of the greatest importance that there should be stated from accurate observation of more cases of this kind the appearances present at any given time, together with exact delineations of them in regular epochs, as it is easy to err when the memory is relied upon, especially when such marked changes appear within a short time.

The fact that it was difficult to obtain a granular current in Case 2 by pressure on the eye indicates that the artery was very rigid, so it could not be readily compressed.

Hirschberg, Perles, Elschnig, and Uhthoff have also observed a turning backward of a granular current. Elschnig, who noticed that sometimes the blood ran backward from a branch into the main artery and then would be driven into another branch while the main stem again became white, ascribed this to a slow vermiform contraction of the main artery. Such an occurrence seems to me to be incredible, and I explain the phenomenon in this way. The agglutinated masses of red blood corpuscles sink in the plasma while it is standing still, and, when a little current of plasma is allowed to enter, are stirred up and come into view. The description given favors a filling of the vessel with plasma rather than a contraction. In a vermiform contraction a changing constriction of both the blood column and of the

vessel wall should be able to be seen. Part of the description is as follows: "In the glistening white superior nasal artery little blood cylinders slowly advance, . . . suddenly there is a complete standstill, the superior nasal artery becomes bloodless, while in its two branches the cylinders advance slowly. Shortly there is a standstill here also, then a backward current begins from the horizontal into the vertical branch, in which the current continues to run in the proper direction." Three hours later the central artery pulsed. The constriction must have been situated peripherally to the place of pulsation, but a satisfactory explanation is impossible because no note was made of certain points the importance of which this paper is to emphasize. I agree with Elschnig that the backward current is due probably to an influx of venous blood from a region in which there is a higher arterial pressure, for an anastomosis with other ciliary vessels cannot be supposed.

The white spots and hemorrhages which appeared in the opposite eye in Cases 2 and 3, as well as the associated nephritis, were results of the arterio-sclerosis. In Case 2 phlebo-sclerosis was also present. The very marked constrictions of the veins show to how great an extent the lumen may be diminished without causing stasis, tortuosity, or hemorrhages.

The mechanism of the production of the clinical picture of the so-called embolism is easily understood after a study of the microscopical examination in my case of hemorrhagic retinitis. The proliferation of the intima narrows the lumen of the artery more and more, the blood is forced through the constriction as long as its pressure is greater than the elastic contractile power of the arterial wall, so that the function of the retina is not interfered with. But a sudden change occurs if either the blood pressure sinks from any cause whatever, or if the tone of the muscularis is increased. In either case the walls will be brought together, particularly when the lumen is slit-shaped, the blood stream interrupted, and the function of the retina arrested. After a longer or shorter time the blood pressure will increase, or the contraction of the vessel walls relax. The damage to the ganglion



cells and nerve-fibres of the retina will be in proportion to the duration of the interruption of the circulation, and on this will depend the injury to the vision. After a very brief anæmia, the nerve elements can recover completely and the vision return to a degree approaching the normal, while the longer the anæmia continues the more will the nerve elements become necrotic and the greater will be the loss of vision.

Thus also is the fact explained that soon after the attack circulation is re-established in the retinal vessels. That the fulness of the vessels increases for a time may be explained by the retrogression of the endarteritic proliferation, which also is perhaps a result of the temporary ischæmia.

Such prodromal attacks as those described by Schnabel and Sachs can also be understood as the direct result of fluctuation in the balance between the tension of the arterial wall and the blood pressure. If some time intervenes as the result of regressive changes, which for a time render the lumen free, new proliferations of the intima occur in the neighboring parts of the walls and cause a fresh attack.

The bilateral attacks can also be understood. In such cases endarteritic changes are present in both central arteries, which cause longer or shorter interruptions of the circulation whenever the blood pressure is reduced, and thereby different degrees of injury to the two eyes.

The so-called transition of an embolism from the main trunk to a branch can also be thus explained. There is a marked thickening of the intima of the affected branch which does not yield when the blood courses again through the central artery, and thus greater disturbances are caused in the region supplied by it.

This theory is supported most of all by those cases in which a granular current is present for some time and then suddenly disappears. A condition in which an artery is filled for many seconds with plasma alone, and then shows a little cylinder of red blood corpuscles ascending, can be explained I think only by the theory of endarteritis proliferans. The cellular elements will glide over the smooth endothelium as long as there is possible room, while they



would have to cling to the rough surface of the thrombus or embolus and be brought to a full stop. Occasionally the cellular elements may accumulate in front of the place of obstruction, where the smallness of the slit allows only the passage of plasma, but as soon as the lumen enlarges, whether actively or passively, they will pass through again.

The cases of Hirschberg, Knapp, and Uhthoff, in which certain arterial branches were at first not involved, but were affected later, can be explained as due to the extension of the endarteritis proliferans.

The idea that the clinical picture of embolism of the central artery is caused by disease of the vessel walls has often been suggested, but the lesion has usually been assumed to be atheroma and consequent thrombosis. In a case of albuminuric retinitis, Hirschberg traced a defect in the visual field to closure of an artery by disease of its walls. Haab, in his observations regarding syphilitic arteritis, remarks that many cases of embolism, in which the source of the embolus is not evident, may perhaps depend on syphilitic endarteritis, and not long ago he advocated the theory of the endarteritic origin of the disease in question. In the same way, Scheffel's case may be thought to be due to syphilitic endophlebitis rather than to thrombosis. It is incomprehensible that long stretches of a vessel can be thrombosed and it still retain a small canal in its middle. At some time the thrombus must cause total closure of the vessel with the resultant symptoms, but this does not seem to have been the case. The rapid retrogression of the symptoms under anti-syphilitic treatment also favors the idea that the lesion was endarteritis proliferans—a direct result of syphilis, rather than a thrombus—a secondary result.

On the basis of a microscopical examination, Raehlmann explains the sudden bilateral blindness of a patient after confinement as due to endarteritis proliferans, and draws attention to the fact that such a condition would explain the hitherto obscure attacks of blindness after loss of blood, and it is very probable that a causal relation exists between such attacks of blindness and endarteritic change in the walls of the central artery of the retina.

A short time ago, Markow quoted the picture of embolism as analogous to that of endarteritis obliterans in spontaneous gangrene.

Heubner was the first to draw attention to the importance of endarteritis proliferans, particularly with regard to diseases of the brain. He believed it to be specifically syphilitic, but this is not the case. It may be caused by syphilis, but is usually a part of a general arterio-sclerosis—primary in that a direct cause has not yet been ascertained, except in some secondary forms which have been described under the name arteritis obliterans. The symptoms of endarteritis proliferans or obliterans have become known to us principally through the work of surgeons in the investigation of spontaneous gangrene. They have shown that the disease is widespread and occurs at all ages. The clinical picture of spontaneous gangrene much resembles that of embolism of the central artery, particularly in its manner of attack. That it frequently results in gangrene of the extremities, but causes necrosis of the nerve elements only in the eye, is in accordance with the peculiar nutritive conditions. In their more dependent position the extremities are more prone to stasis of blood, exposed to injury, and depend for their nourishment on the branches of one artery, while in the eye the lymph stream from the chorio-capillaris suffices for a part of the nutrition of the retina, so that when the central artery is closed the supporting substance of the retina retains its vitality, although the sensitive nervous elements are ruined. The retina is nourished by two systems of vessels in a measure independent of each other.

We do not yet know whether this disease finally results in obliteration of the retinal vessels or not, because the patients seldom remain under observation sufficiently long after they have become blind for this to be determined, but it is possible that after it has reached a certain degree the endarteritic proliferation may undergo a retrograde metamorphosis. This may have been the condition in the cases observed by Raehlmann and others, in which there was a marked constriction of the lumen from arterio-sclerosis, persisting in some of them for a long time, without total closure of the

vessel or stoppage of the circulation. I have seen in a woman forty-one years old, who had a glaucomatous excavation of the papilla, a short well-marked constriction of the lumen of a retinal artery near the margin of the optic disc, the peripheral portion of which retained very nearly its normal calibre, and in a man sixty-eight years old nearly all the branches of the central artery much constricted in places on the papilla and in the neighboring parts of the retina, while more peripherally their calibre was only moderately and uniformly reduced. In neither case was there a scotoma.

The source from which an embolus may have come can by no means always be demonstrated, but almost all of these patients have arterio-sclerosis. Even when the disease is not present in the arteries which can be palpated it may exist in other arteries, and many of the demonstrable defects of the cardiac valves wholly depend on arterio-sclerotic changes without thrombus formation, which furnish no material for an embolus. Arterio-sclerosis may be found simultaneously in the eye, kidneys, brain, coronary arteries, and other organs.

It can hardly be considered an accidental coincidence that arterio-sclerosis so often affects the central artery and its branches, and that changes similar to those produced by it have been described in so-called embolism, especially of the branches. It is more reasonable to think that endarteritis proliferans should be considered the chief factor in the production of the clinical picture in question, particularly as all the symptoms can thus be satisfactorily accounted for. Even if arterio-sclerotic changes should not be visible in the artery, they might be present proximally to the point where it comes into view.

Thrombosis and embolism can happen in the central artery or in one of its branches, but if the circulatory conditions in the eye are correctly understood, either lesion must cause a total and long-continued interruption of the circulation, visible signs of agglutination in the vessels, and complete blindness from the first. In embolism of a branch the embolus should be plainly seen.

I agree with the commonly accepted opinion that the



retinal opacity is caused by the granular haziness and swelling of the nervous elements of the innermost layer of the retina, together with a more or less marked serous exudation, a condition similar to the post-anæmic changes in the kidney, spleen, uterus, and other organs, which are known under the name of ischæmic or white infarction. In time the necrosed tissue elements are absorbed so that the white opacity disappears, but the retina does not seem to regain its normal transparency, a delicate rough haze remains, most plainly to be seen at the posterior pole.

Extensive retinal hemorrhages have been observed very seldom, perhaps because when they do occur soon after the attack the case is diagnosed as one of hemorrhagic retinitis. I believe that cases of sudden failure of vision which present the ophthalmoscopic picture of hemorrhagic retinitis with small arteries and few or no choked veins belong to this class. Why hemorrhages should occur in one case and not in another I do not know. No satisfactory explanation has yet been made of the so-called hemorrhagic infarct in general pathology, but it is known that they can be produced experimentally only under very favorable circumstances. In the eye various factors may need to be taken into account, such as the general condition of the vessels, the duration of the interruption of the circulation, the amount of injury to the vessel walls from the anæmia, the height of the blood pressure, and the condition of the blood itself.

In regard to the red spot in the macula, I adhere to the usual view that it is caused by the choroid showing through the unclouded retina at this point, and that its color appears intensified through contrast with the surrounding white opacity. In Case 2 a fine physiological marking of the choroid could be seen, and the thickness of the retina almost estimated from the parallactic movements of the white dots against the red of the chorio-capillaris and pigment epithelium. The color of the spot naturally varies with the amount of pigment in the pigment epithelium and choroid in individual cases. The microscopical changes in the pigment epithelium found by Elschnig may have been only



secondary, because it is difficult to understand how they could have been produced directly by the attack, and it is known that the pigment epithelium is secondarily involved in very different retinal diseases. But such changes cannot usually be marked in so-called embolism, because a fine pigment granulation, such as is sometimes seen in a senile macula, is often mentioned, especially of late, among the ophthalmoscopic appearances.

The optic atrophy which results from so-called embolism is in unison with the view held at the present time, that the optic-nerve fibres appertain to the ganglion cells of the retina and are involved in their atrophy.

*Conclusions.*—(1) There can be said to be complete interruption of the circulation only when the blood column is broken to pieces on the peripheral side of the place of obstruction.

(2) While the theory of embolism or thrombosis does not explain many of the symptoms of the clinical picture in question, the theory of endarteritis proliferans of the central artery, or of the retinal artery affected, satisfies all the demands which may be made upon it, and this disease is present at all events whenever thickenings of the walls of the arteries are visible with the ophthalmoscope. With true embolism or thrombosis, both of which may occur in the retinal arteries, complete blindness and a breaking up into granules of the blood columns of the affected retinal vessels must be expected.

# SYSTEMATIC REPORT ON THE PROGRESS OF OPHTHALMOLOGY IN THE FOURTH QUARTER OF THE YEAR 1902.

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## I.—GENERAL OPHTHALMOLOGICAL LITERATURE.

461. **Groenouw** and **Uthoff**. The relations of general and organic dis-  
eases to affections of the eye. *Graefe-Saemisch*, 2d edition, Leipsic, 1902.

462. **Bernheimer**. Etiology and pathological anatomy of ocular-muscle  
paralyses. *Ibid*.

463. **Hess**. Anomalies of refraction and accommodation with an introduc-  
tion to the dioptrics of the eye. *Ibid*.

464. **Snellen**. Eye operations. *Ibid*.

465. **Lagrange** and **Valude**. *French Encyclopædia of Ophthalmology*,  
Vol. 1. History of Ophthalmology. Anatomy of the Eye and its Adnexa.  
Physiology. Paris. O. Dorin, 1903.

466. **v. Reuss**. The visual field in functional nervous diseases. Leipsic  
and Vienna, 1902. F. Deuticke.

467. **Javal**. How to counsel adults who become blind. *Bull. de mém. de  
la soc. franç. d'opht.*, xix., p. 268.

468. **Eversbusch.** Practical testing of the color sense with the signal lights used in the railway service. *Deutsche med. Wochenschr.*, 1900, Lit. Beil., p. 302.

469. **Kubli.** Brief reports from eye practice. *Wjest. ophth.*, 1902, No. 6.

470. **Brüning.** Report on the work done in the University eye clinic at Tübingen from 1875 to 1901. Tübingen, 1902.

471. **Bock.** Twelfth report on the department for diseases of the eye in the hospital at Laibach.

472. **Wood, C. A.** Address on an exhibit of early (prior to 1860) British and American ophthalmic literature. *Journ. Amer. Med. Assoc.*, Nov. 8 and 15, 1902.

GROENOUW (461) describes metastatic ophthalmia, the affections of the eye in sepsis, splenic fever, actinomyces, trichinosis, etc. Further chapters treat of ocular affections in measles, scarlatina, smallpox, vaccinia, varicella, and erysipelas.

The article by BERNHEIMER (462) forms the conclusion of his excellent treatise on the etiology and pathological anatomy of the paralyses of the ocular muscles.

Arlt's treatise on operations in the first edition of *Graefe-Saemisch* has been worked over by SNELLEN (464), since in the last two decades more changes have occurred in this department than in any other. Following a section on anæsthesia, antisepsis and asepsis, mydriatics and miotics, instruments and dressings, he describes the operations for cataract, iridectomy, glaucoma operations, the operations for staphyloma of the cornea, enucleation, and exenteration.

LAGRANGE and VALUDE (465) have prepared with the assistance of colleagues of the Latin lands a French handbook of ophthalmology after the model of Graefe-Saemisch. The first of the projected eight volumes contains the following articles: Pansier, a short history of ophthalmology; Lagrange (Bordeaux), general anatomy of the orbit; Motais (Antwerp), anatomy and physiology of the motor apparatus of the eye; Rollet (Lyons), anatomy of the pneumatic cavities of the face; Terson (Paris), anatomy and physiology of the eyelids; Kalt (Paris), anatomy and physiology of the lachrymal apparatus; Berger (Paris), general anatomy of the eyeball; Morax (Paris), anatomy of the conjunctiva and cornea; Rohmer (Nancy), anatomy and physiology of the sclera; Venneman (Loewen), anatomy and physiology of the uveal tract; Truc and Vialleton (Montpellier), anatomy of the lens, with a historical introduction by Dor (Lyons); Rohmer

(Nancy), anatomy and physiology of the vitreous; Rochon-Duvignaud, anatomy of the sensory nervous apparatus of the eye: retina (under the direction of Mathias Duval), optic nerve, optic-nerve centres. Numerous illustrations, many of them new, accompany each article. The mechanical book-work is excellent.

BERGER.

v. REUSS (466) describes the visual field in functional nervous diseases. His material includes 85 cases, only 7 of which were not traumatic. Of these 78 cases, 59 followed railway accidents, 5 a fall on the ground or from a low elevation, and 2 a fall from a greater height; the rest followed different injuries.

He divides the cases into two groups: the earlier, 32 in number, seen before Nov., 1898, and the later 53 seen since that date. In the latter group fatigue symptoms were always looked for and found in 40 cases. In the general part of the monograph, v. Reuss describes the normal field of vision and then the defects such as are found in hysteria and neurasthenia, the displacement type, Wilbrandt's fatigue type, concentric contraction, the so-called fatigue-spirals, the rest extensions, and finally the mixed forms. The special part contains the 32 earlier cases, of which 13 had normal fields and the rest contractions. Among the 53 later cases fatigue-spirals were found in 40 cases or 70 eyes. Only 22 eyes had fields with normal limits. The ophthalmoscopic examination was almost invariably normal, and diminution of vision was found in but 25 persons in one or both eyes. The fatigue is no retinal process, but a psychical fatigue.

EVERSBUSCH (468) has had constructed a testing apparatus which furnishes an exact representation of the day and night signals. For the night tests he uses blue and yellow as well as green and red in his lantern, in order to render more difficult the orientation in respect to green and red, which the difference in luminosity assists in the color-blind.

From 1875 to 1901, 17,518 patients were admitted to the Tübingen University eye clinic (470), and 46,615 out-patients were treated. The number of cataract operations was 3546, and of enucleations, 845.

BOCK (471) in 1901 treated 1273 patients in the Laibach hospital: Cataract operations, 104; iridectomies, 103; squint operations, 6; and enucleations, 20. No suppuration after cataract operations.



## II.—GENERAL PATHOLOGY, DIAGNOSIS, AND THERAPEUTICS.

- 472 A. **Saffner**. Bulbus septatus. *Graefe's Archiv*, liv., 3, p. 509.
473. **Orloff**. On the eye changes in chronic poisoning with secale cornutum and its preparations. Preliminary communication. *Wratsch*, 1902, No. 53.
474. **Woitzechowsky**. On metastatic affections of the eye in general and local infections. *Wjest. ophth.*, 1902, 4-5.
475. **Bohn**. Congenital and acquired pathological pigmentation of the eyeball. *Inaug. Dissert.*, Giessen, 1902.
476. **Golowin**. On changes in intraocular tension from compression of the carotid. *Wjest. ophth.*, 1902, 4-5.
477. **Engelmann**. Tonometric investigations on healthy and diseased eyes. *Juriew*, 1902.
478. **Dimmer**. Photography of the fundus. *Berl. klin. Wochenschr.*, 1902, No. 49.
480. **Trantas**. Ophthalmoscopy of the ciliary body. *Ann. d'ocul.*, cxxviii, p. 301.
481. **Thorner**. Photography of the fundus. *Berl. klin. Wochenschr.*, 1902, No. 43.
482. **Hinshelwood**. Congenital word-blindness. *Ophth. Review*, April, 1902.
483. **Randolph, R. L.** The rôle of toxins in inflammations of the eye. (Prize essay.) *Amer. Journ. Med. Sciences*, Nov., 1902.

SAFFNER (472 A), on enucleating a child's eye that was larger than the other, lacked the lower segment of the iris, had an opacity of the corresponding portion of the cornea, and exhibited what appeared to be a cyst behind the cloudy lens, found a tract of tissue passing forward from the disc and ending in part about the lens and in part in the wall of a cystic cavity. This cavity was situated at the bottom of the ball between the margins of an iris and ciliary coloboma, and extended into the anterior chamber; the lens was luxated upward and inward. The tract of tissue was not connective tissue but glia tissue.

ORLOFF (473) used in his experiments chickens, rabbits, guinea-pigs, and cats—in all twenty-one animals. In four animals cataract developed. In many, mydriasis and almost complete loss of light reaction was observed. The microscopic examination of the retina revealed a vitreous degeneration of the vessels in some eyes and various changes in the ganglion cells up to their complete destruction.

HIRSCHMANN.

BOHN (475) reports four cases of congenital melanosis of the sclera and two of the cornea. Acquired melanosis may be caused

by the healing in of powder grains or by the entrance of soluble coloring matters like anilin.

The manometric method of determining the intraocular tension is not applicable in man and is otherwise very uncertain because of the necessity of introducing a canula.

The results obtained by GOLOWIN (476) in normal eyes by this method, and also by compression of the carotid or jugular, and the ligation of the venæ vorticosæ, are too divergent to be regarded as accurate.

The tonometric method, the only one that can be used on man, is much more accurate. The best instruments are those of Fick and Maklakoff, the latter being, in the writer's opinion, preferable. Measurements made with this instrument on fifteen eyes before beginning the compression of the carotid, one-half minute, one minute, and two minutes after beginning the compression, and again after ceasing the compression, gave the following results: In a group of seven eyes the tension before compression was normal, but decreased from 1-5.5 *mm* Hg (on an average 2.5 *mm* Hg) during the compression. In five other eyes with glaucomatous increase in tension before compression, the tension was reduced a varying amount after compression was begun, but long continuance of the compression did not lead to further reduction but rather to increase.

HIRSCHMANN.

The valuable treatise by ENGELMANN (477) contains chapters on the following topics:

1. A short account of the tonometry of the eye. Maklakoff's tonometer.
2. The influence of blood tension upon intraocular tension.
3. Intraocular tension in general narcosis.
4. The influence of the sympathetic upon intraocular tension (*a*) in animals, (*b*) in man.
5. What effects has the play of the pupil upon the height of the intraocular tension in man?
6. The influence of the extrinsic ocular muscles upon the intraocular tension.
7. Intraocular tension in accommodation.
8. Tonometric measurements in various diseases of the eye.

HIRSCHMANN.

TRANTAS (480) finds that if gentle pressure is made upon the ciliary region with the thumb after atropine and cocaine have been used the ciliary body may more readily be seen. The examination

is made in the upright image with a lens of 4-5 D. The writer presents drawings of the ophthalmoscopic picture of the ora serrata in the normal eye (of which he distinguished four types), in irregular atrophy of the pigment, in colloid excrescences, and in hereditary syphilis.

BERGER.

✓ THORNER (481) presents satisfactory photographs of the fundus of the cat taken by means of his ophthalmoscope, which eliminates the corneal reflex.

N HINSHELWOOD (482) reports two further cases of this condition. One was in a girl aged ten, who was in all other respects quite healthy yet she had the greatest difficulty in learning to read. It took her nine months to learn the alphabet and after four years she could only read the simplest words without spelling them.

The second case was that of a boy aged seven, also in other respects quite healthy and particularly sharp, but he could scarcely read a single word without spelling it, though he could be taught easily enough orally, and he escaped detection for some time by learning his reading by heart. The first case has not been seen since, but the second after special reading lessons repeated frequently got on wonderfully well. It is useless to have such children educated in ordinary classes with others without this defect; they must be taught separately with lessons specially adapted to overcome their difficulty. The author is most emphatic on such children being examined by competent persons, otherwise the most useful years of education are lost and they become backward and defective through life.

✓ MARSHALL.

✓ Infectious bacteria produce inflammation in the conjunctiva by their presence and by the production of toxins. The part played by the latter is the problem attacked by RANDOLPH (483). In a series of forty experiments on rabbits, the toxins from the gonococcus, staphylococcus aureus, Klebs-Löffler bacillus, bacillus coli communis, micrococcus epidermis albus, and xerosis bacillus were kept in contact with the conjunctiva constantly, often for many hours, and in practically every case no reaction followed. On the contrary, when these toxins were injected into the conjunctival tissue more or less violent reaction was produced, and when injected into the anterior chamber iritis was caused in every case.

Bearing on the subject under consideration, experiments were made to determine the presence of bacteria in the conjunctival sac of the healthy rabbit. These resulted in the conclusion that quite a variety of micro-organisms are normally present, as is the



case in the human conjunctiva. This point might have some influence on the results obtained from the injections, and the author believes that, although the toxins are directly responsible for the essential damage, as was shown by control experiments, they may, at the same time, impair the resisting power of the tissues to the bacteria already present. The foregoing experiments demonstrate that when the epithelium is intact and no opportunity for penetration is offered, toxins produce no local injury to the animal. It is suggested that the injection of bacterial infiltrates into the eye, particularly into the conjunctiva, constitutes a more delicate biological test for the detection of certain toxins than the methods usually employed.

ALLING.

### III.—INSTRUMENTS AND REMEDIES.

- 484. Fuchs. On cocaine. *Wiener klin. Wochenschr.*, 1902, No. 38.
- 485. Kasass. Eserine in keratitis. *Wjest. ophth.*, 1902, No. 6.
- 486. Cervicek. On the use of itrol and cuprocitol. *Der Militärarzt*, 1902, 19-20.
- 487. Kubli. Ichthargan in eye practice. *Wratsch*, 1902, No. 49.
- 488. Skorjuchew. On the use of brucin in eye practice. *Inaug. Dissert.*, St. Petersburg, 1902.

In all operations, even the most trivial, FUCHS (484) instils a few drops of a 5 % cocaine solution, keeping the eyes closed in the intervals. If there is much injection he uses adrenalin 1:1000 or injects cocaine beneath the conjunctiva. In operations on the lids cocaine is injected beneath the skin, in muscle operations beneath the conjunctiva, in operations on the lachrymal passages into these. In chalazion he instils cocaine into the conjunctival sac and injects a drop or two into the chalazion itself. Schleich's infiltration method is not to be commended for operations on the lids and muscles, since the œdema renders the operation difficult.

KASASS (485) recommends, in all cases of keratitis, whether ulcerous or non-ulcerous, with the exception of parenchymatous keratitis, the use of eserine salicyl. in the form of a salve with or without xeroform, instead of atropine. In miliary phlyctenulæ also the effect is brilliant.

HIRSCHMANN.

CERVICEK (486) treated one hundred and twenty-four cases of blennorrhœic conjunctivitis and eighteen cases of secreting trachoma with itrol. This is more irritating than a 2 % silver solution, but its effect lasts longer. He applies it with a powder blower, so that the action of light and air upon the very delicate



preparation is avoided. After using it a few times the irritability of the eyes is much diminished. He treated twenty-six cases of trachoma with cuprocitrol in various stages with good effects in part, using a 5-10 % salve and massaging the eye.

KUBLI (487) used 1-10 %, but mostly 2 % solutions of ichthargan. In twelve hundred patients he obtained the following results: In inflammation of the margin of the lid, if mild, ichthargan acted favorably; in severe cases, nitrate of silver is to be preferred. In cases of hordeolum, eczema, wounds, and abscesses, ichthargan favors recovery. In acute conjunctivitis, blennorrhœa, trachoma, and pannus, its effect is far inferior to that of silver or copper. It does not cause argyrosis.

SKORJUCHEW (488) concludes from many observations that brucin increases the central and peripheral vision in both healthy and diseased eyes, increases the strength of the muscles and diminishes their pareses, and frequently dilates the vessels, chiefly the arteries, of the fundus.

Brucin can be used with advantage in various amblyopias, in acute and chronic retrobulbar neuritis, optic-nerve atrophies, retinitis pigmentosa, and paralysis of accommodation. It is contra-indicated in acute inflammatory affections of the coats of the eye.

HIRSCHMANN.

Sections IV.-VII. Reviewed by DR. ABELSDORFF, Berlin.

#### IV.—ANATOMY.

489. **Prokopenko.** On the distribution of elastic fibres in the human eye. *Graefe's Archiv*, lv., 1, p. 94.

490. **Howe, L.** A study of the connective tissue of the orbit by a new method. (Prize essay.) *Annals of Ophth.*, Oct., 1902.

PROKOPENKO'S (489) investigations, made chiefly by means of Weigert's and Unna's stains for elastic tissues, cover the distribution of the latter in all the tissues of the human eye, and in the main confirm the results of other recent investigations. It may be mentioned that the writer found elastic fibres in the cornea, but not in the iris; the limiting membrane beneath the pigment epithelium of the iris differing in its staining properties from elastic tissue, and being considered by him a dilatator muscular tissue.

HOWE (490) uses Zenker's fluid for fixing and alcohol for hardening, removing excess of mercury with Gram's solution. Then, wash in water; second, place in one per cent. solution of potass.

permanganate; third, wash; fourth, one and one half per cent. solution of oxalic acid until decolorized; fifth, wash; sixth, stain with fuchsin; seventh, wash; eighth, stain with anilin blue; ninth, wash; tenth, alcohol-xylol balsam. The method is similar to that of Mallory, but the use of permanganate and oxalic acid renders the tissues more susceptible to stain. The study of specimens of Tenon's capsule confirms the views of Schwalbe that, while the capsule is contracted at the nerve entrance, there is still a passage between the space around the globe and that about the nerve. The capsule proper is shown not to extend farther forward than the insertions of the muscles. Sections also show extensive attachments between the capsule and the muscles as well as to the soft parts and the edge of the orbit. The check ligaments, which are thickenings of the aponeurosis which passes from the edge of the orbit to the capsule and muscles, are fully described. Beside the internal and external check ligaments, the author designates others as the inferior and superior. Photographs of the connective tissue attached to the muscles and of the fascia orbito-ocularis add a new and helpful feature to methods of demonstrating these tissues.

ALLING.

#### V.—PHYSIOLOGY.

491. **Schoute.** The retinal cone in its function as end organ. *Zeitschr. f. Augenheilk.*, viii., p. 419, 1902.

492. **Reimann.** The apparent enlargement of the sun and moon on the horizon. *Zeitschr. f. Psychol. u. Physiol. d. Sinnesorgane*, 30, p. 1.

493. **Levinsohn, G.** On the relation between the cerebral cortex and the pupil. *Zeitschr. f. Augenheilk.*, viii., 5, p. 518.

SCHOUTE'S (491) investigations were toward the solution of the question whether the individual retinal cone as an end organ had only the function of conducting the intensity of the excitation—*i. e.*, only quantitative differences. The same amount of light falling upon a cone must then always give rise to the same perception.

Thus, in fact, different forms on a cone were always seen as round. It was possible further, by other experiments, to show that the area perceived with a cone did not depend upon the extent of the image, but only upon the amount of light. Since the latter is the product of the area of the image and its luminosity, a large image on a cone appears no larger than a small image of greater luminosity.

REIMANN (492) gives a historical résumé of the question in regard to the larger appearance of the heavenly bodies near the

horizon and offers the following explanation of his own: With the increasing tenuousness of the atmosphere above the refraction of light is weaker, and therefore much less diffuse light comes from the zenith than from the horizon. On the lower darker strata of atmosphere the light particles in the air are projected as an apparent sky, and therefore the sky at the zenith appears nearer than at the horizon. The visual angle remaining the same, objects near the horizon, which is apparently farther distant, appear larger than objects at the zenith.

LEVINSOHN'S (493) experiments were made on monkeys, cats, and dogs—those on monkeys being most satisfactory—after the sympathetic or the superior ganglion on one side had been extirpated. It was not possible to produce contraction of the pupil by the excitation of particular points in the cerebral vortex. A dilatation of the pupil was obtained, however, not only with the epileptoid convulsions caused by excitation of the cortex and the excitation of the motor sphere, but from three particular spots: (1), the cervical sphere, (2) the sensory sphere of the eye, and (3) the visual sphere. The dilatation usually took place in both eyes, but was less pronounced on the operated side. Since the dilatation rarely appeared alone, but was accompanied in the beginning by movements of the eyes or lids, and since extirpation of the cortical points in question caused no permanent symptoms, the dilatation of the pupil must be only a secondary symptom, attributable, in the writer's opinion, to simultaneous relaxation of the oculomotor and excitation of the sympathetic.

#### VI.—REFRACTION AND ACCOMMODATION.

494. **Einhoven.** The accommodation of the human eye. *Ergebnisse des Physiol.*, vol. i., Wiesbaden, 1902. Bergmann.

495. **Liebreich.** The treatment of myopia. *Klin. Monatsbl. f. Augenheilk.*, xv., 2, p. 289, and *Therapeutische Monatshefte*, Dec., 1902.

496. **Salzmann.** The atrophy of the choroid in myopic eyes. *Graefe's Archiv*, liv., 2, p. 337.

497. **Widmark.** A contribution to the etiology of myopia. *Hygieia*, Aug.-Sept., 1902.

498. **Jackson, E.** The full correction of myopia. *Ophth. Record*, Nov., 1902.

EINTHOVEN (494) gives, besides a detailed résumé of the literature, a sketch of the accommodation theories of Tscherning-Schoen and Helmholtz, with particular reference to the tremulousness of



the lens in accommodation, discovered by Hess. The writer accepts the Helmholtz theory.

According to LIEBREICH (495) only the nasal portion of the orbit need be taken into consideration in errors of refraction and strabismus, since the centre of rotation of the ball and the ocular muscles have a constant relation to the inner wall only, while their relation to the unsymmetrical temporal half of the orbit varies greatly. The principal measurement is the pupillary distance, which serves to fix the angle B which the two axes of the muscle funnels make with each other. When the angle B is large, the internal recti in fixation must make a supra-normal effort, and thus, according to Liebreich, there is too great an accommodative effect, with the tendency to bring the object fixated too near. In order to exclude the injurious influence of the angle B and to regulate the conditions of accommodation and convergence, Liebreich in the prophylaxis and treatment of myopia orders prisms in order to diminish convergence, or concave glasses to allow a more distant point of fixation, or a combination of the two glasses.

SALZMANN'S (496) valuable paper includes the anatomical examination of six myopic eyes in which he found diffuse and circumscribed changes in the choroid. The former, found in the entire region of the staphyloma posticum, are characterized by great thinning of the choroid with absence of the larger vessels, while the latter are limited to the inner layers or may involve the entire thickness of the choroid later and show absence of the vessels and of the stroma pigment cells. The lamina vitrea is thinned or exhibits breaks. These are at times closed by a new-formed membrane on the inner lamella of the old membrane. As a result of the absence of the capillary layer, there are changes in the pigment epithelium and destruction of the rod and cones and outer nuclear layer.

The whole process, according to Salzmann, begins in the lamina vitrea, since at many points changes in it alone are found. In the development of staphyloma posticum, the lamina vitrea bulges backward and finally ruptures, after which the choroidal vessels degenerate. Inflammation plays in the pathogenesis of these choroidal atrophies only a secondary rôle.

From the anatomical conditions Salzmann concludes that in treating myopic atrophy of the choroid the tension should be kept down. In this sense he believes that the removal of the lens has



a favorable effect, and the improvement in vision after the operation cannot be explained as a purely optical one.

WIDMARK (497) reports from his practice several cases, with weakness of vision congenital or acquired in early life in one eye, in which myopia had developed in the other eye, which at first had good vision.

In some cases in which the one eye was enucleated in childhood, myopia developed in the other eye. These observations led the writer to collect one hundred cases of anisometropia in which there was at least 2. D difference in the refraction of the two eyes and one eye at least was myopic. He found that in a large number of these cases the vision in the lesser myopic or non-myopic eye was weakened by corneal opacities or astigmatism. This fact cannot be explained by the convergence theory. The probable cause seems to the writer to be the different acuteness of vision in the two eyes. The eye with better vision is, in general, that which is chiefly used in near work and therefore the myopia develops mostly in this eye.

The writer has in recent years determined the location of the near point in myopes by having the patient fixate a small flame and finding the point where the corneal image of the flame passes inward in one eye as binocular fixation was lost. He found by this method that most myopes can fixate up to 4cm. Traction on the optic nerve at the posterior pole of the eye can therefore hardly occur at the usual working distance. The writer believes that convergence has as little to do in producing myopia as accommodation does.

The writer generally gives myopes the full correction if accommodation and convergence are good. Yet he does not find that the artificially created emmetropia for those eyes which natural emmetropia has not prevented from becoming myopic offers the protection against the increase of myopia which others have reported to have found. Nor does he see any reason for giving myopes of less than 2. D correcting glasses for near work if there are no asthenopic symptoms.

DALÉN.

JACKSON (498) reports the histories of 35 cases of myopia treated with full correction. These, with cases already published, make a series of 62. Since myopia, as a rule, is stationary after twenty years of age, the statistics referring to this class, including 35 eyes, are the most instructive. During periods covering from three to eleven years, 60 per cent. did not become more myopic

after beginning to wear glasses, while in 14 eyes the myopia at some time increased more than 0.25 D, in 4 eyes it diminished more than that amount. In nearly all the cases the myopia was clearly progressive before correcting lenses were given. The author's observations confirm the common opinion that full correction is generally proper in uncomplicated cases. ALLING.

# VII.—MUSCLES AND NERVES.

499. **Nicolai.** A new ocular muscle—musculus papillæ optici. *Ann. d'ocul.*, cxxviii., p. 342.

500. **Lenoble and Aubineau.** Infantile tremors and congenital nystagmus. *Arch. de Neurol.*, 1902, No. 80.

501. **Korniloff.** Associated paralyses of the ocular muscles. *Wjest. ophth.*, 1902, 4-5.

502. **Haltenhoff.** A case of cephalic tetanus with facial and ocular paralysis; recovery. *Revue méd. de la Suisse romande*, Sept. 20, 1902.

503. **v. Frankl-Hochwort.** A case of acute paralysis of the extrinsic muscles supplied by the third nerve, due to neuritis. *Arbeiten aus dem Neurol. Instit. a. d. Wiener Universität*, ix., 1902.

504. **Ackermann.** Complete unilateral paralysis of the third nerve from basilar hemorrhage, with autopsy. *Klin. Monatsbl. f. Augenheilk.*, xl., 2, p. 306.

505. **Strassburger.** Sluggishness of the pupil with accommodation and convergence. *Neurol. Centralbl.*, 1902, No. 16.

506. **Piltz.** The paradoxical reaction of the pupils and a new observation of contraction of the pupils when the eyes were shaded. *Ibid.*, Nos. 20-22.

507. **Jackson, E.** Heterophoria and the indications it gives for treatment. *Amer. Jour. of Ophth.*, Nov., 1902.

508. **Prince.** Section and exsection of the recti muscles for cosmetic effect in cases of squint inoperable by tenotomy and advancement. *Amer. Jour. of Ophth.*, Sept., 1902.

509. **Posey.** Associated movements of the head and eyes. *Four. Amer. Med. Assoc.*, Nov. 29, 1902.

NICOLAI (499) believes that the van Giesen stain and the trypsin reaction indicate that the fibres lying about the optic disc are unstriated muscle fibres. He distinguishes three groups of fibres in his musculus papillæ optici: (a) circular, (b) longitudinal, and (c) radial fibres. No theory of the physiological significance of the muscle is offered.

BERGER.

LENOBLE and AUBINEAU (500) studied the existence of nystagmus without eye disease in its relations to other tremors. They distinguish the following forms:

1. Essential nystagmus without accompanying symptoms.

2. Nystagmus with the existence of independent symptoms, such as inequality of the pupils and asymmetry of the face.

3. Nystagmus with analogous nervous symptoms, such as epileptoid twitchings and increased reflexes.

4. Nystagmus as a symptom of tumor, developing alone or with twitching in other parts of the body.

KORNILOFF (501) reports two cases:

1. In a child of six there developed, after a slight trauma, in the course of two weeks and a half, abnormal eye movements, then headache, vomiting, weakness in the feet and hands, ataxia, normal temperature, slight paresis of the seventh nerve. The lateral and medial movements of the eye are normal, but there is absolute inability to move the eyes up or down. All these symptoms passed off gradually, first in the hands and feet, then the motility of the eye returned, and in six weeks there was complete recovery.

2. A child of four. With a slight increase in temperature the following complexus of symptoms developed: weakness of the feet and of the right hand, disturbances of speech, apathy with preservation of intelligence, limitation of motility in the right hand and right foot, the face somewhat oblique to the right, pronounced Babinsky's symptom, bilateral ptosis, left eye in repose slightly convergent. Motility of both eyes to the right normal, to the left restricted, upward almost abolished.

In the first case a diagnosis of poliencephalitis was made, in the second tubercle in the corpora quadrigemina. The author believes in the existence of supranuclear centres of co-ordination, in favor of which speak cases in which there is inability to move the eyes in some direction by an effort of the will, yet with preserved reflex motility.

HIRSCHMANN.

HALTENHOFF (502) describes a very remarkable case of Rose's tetanus with paralysis of the facial and abducens. In a child of three an injury led to prolapse of the lachrymal gland, and this was extirpated. After the operation the wound suppurated, which was attributed to the presence of dirt in the wound. Having in mind the possibility of tetanus infection, Professor Massol advised a prophylactic injection of tetanus serum. Nevertheless, two days later there developed spasms of the gustatory muscles, facial paralysis, and paresis of the abducens upon the injured side. These symptoms passed off after removal of a splinter of wood, and the case ended in complete recovery. This favorable result



was attributed to the use of tetanus serum. It is well known that the cases in which tetanus appears soon after the injury, or is complicated with facial paralysis, are severe; in this case the presence of tetanus germs in the vascular tissue of the orbit might be regarded as rendering the prognosis more grave. In fact the mortality of Rose's tetanus is very great. Of 64 cases which Haltenhoff found in the literature, 39 were fatal. BERGER.

V. FRANKL-HOCHWORT'S (503) case was in a right hemiplegic of sixty-seven, who suddenly was attacked with paralysis of the extrinsic muscles supplied by the right third nerve. The pupils remained normal on each side. The autopsy revealed extensive atheroma but a normal condition of the nuclei of the ocular muscles and of the ciliary ganglia.

The trunk of the right oculomotor exhibited the picture of an acute interstitial neuritis. There was, therefore, a partial oculomotor paralysis due to a localized, non-syphilitic neuritis—a fresh proof that, contrary to Mauthner's dictum, a unilateral paralysis of the extrinsic muscles does not necessarily imply a nuclear lesion.

ACKERMANN'S (504) patient, a boy of fifteen, had a complete left oculomotor paralysis, excepting the sphincter iridis and muscle of accommodation, which were merely paretic. The patient died in coma, and the autopsy showed a hemorrhage above the pons between the arachnoid and the pia.

The oculomotor trunk was surrounded before its exit through the dura by a connective-tissue membrane organized from a blood clot. Microscopic examination showed at this point atrophy with secondary degeneration of the peripheral fibres. Only in the centre of the medial third of the nerve did Weigert's stain show that the nerve fibres were preserved. Since the intrinsic muscles were not completely paralyzed, the writer believes that the fibres which he found normal belonged to these muscles. Their central protected location explains the paralysis of the extrinsic muscles alone.

STRASSBURGER (505) observed in three patients with unilateral or bilateral reflex iridoplegia that the contraction with convergence was well-marked but very sluggish, and the dilatation following contraction required 10–20 seconds instead of 2–3.

PILTZ (506), after a critical examination of the literature, comes to the conclusion that the paradoxical reaction of the pupil



(dilatation on exposure to light) is a very rare condition, and that only four of the cases reported are above criticism. He adds a fifth case of his own, with atrophy of the optic nerves, in which, after illuminating the eyes, the pupils contracted when they were shaded.

JACKSON'S (507) conservative view of the treatment of heterophoria is indicated by the fact that in 714 cases of one-half centrad and upwards only three came to operation. Heterophoria does not necessarily require special treatment since correction of ametropia is generally sufficient. Before resorting to operation, graduated exercises, gymnastics, and general treatment should positively prove to be unavailing. ALLING.

PRINCE (508) has frequently performed exsection of the opposing muscle in cases of paralysis and extreme over-effect of long standing, following extensive tenotomies. One obvious objection to the procedure is the danger of exophthalmus, but it seems not to have proved serious. ALLING.

To six reported cases of torticollis secondary to paralysis of one of the eye muscles, POSEY (509) adds the notes of another which presented the following conditions: A boy of nine had had a wry-neck since infancy, the head drooping upon the right shoulder while the face was turned to the left. The eyes are level in this position, but when the head is straightened the right eye is turned down and the patient fixates with the left. The right superior rectus is probably at fault. Operation was refused and prisms failed to benefit the deformity. Another case of spasmus nictitans is given, in which the child habitually held the head turned to the left side and slightly downward and rotated it from side to side. These movements were rhythmical but under the control of the will. The eyes showed pronounced convergent strabismus of the left with vertical and slightly rotary nystagmus of both. The latter movements were about five times as frequent as those of the head. ALLING.

Sections VIII.-XII. Reviewed by DR. R. SCHWEIGGER,  
Berlin.

#### VIII.—LIDS.

510. **Winselmann.** Is the blepharitis characterized by ulceration of the lid margin to be regarded as an eczema? A contribution to the etiology and therapy of blepharitis ulcerosa. *Klin. Monatsbl. f. Augenheilk.*, xlii., 2, p. 393.

511. **Schillinger.** A further case of gangrene of the lid with the presence of diphtheria bacilli. *Inaug. Dissert.*, Tübingen, 1903.
512. **Lotin.** Premature grayness of the lashes and brows. *Wjest. ophth.*, 1902, 4-5.
513. **Panas.** So-called congenital ptosis. *Arch. d'ophth.*, xxii., No. 11, p. 677 (with illustrations).

After examining epilated lashes, WINSELMANN (510) concludes that ulcerative blepharitis is a primary parasitic disease of the roots of the lashes similar to sycosis and not to eczema. A secondary blepharitis can of course arise from an eczema. The rational therapy consists in total epilation. Normally there are two sorts of lashes whose relative number differs greatly in blepharitic processes.

SCHILLINGER (511) considers an early bacteriological examination necessary in all forms of spontaneous gangrene of the skin. If positive or even suspicious results are obtained, serum therapy is to be at once resorted to.

LOTIN'S (512) patient was a girl of seventeen in whom in the course of a year, after frequent attacks of migraine, the lashes of the left eye all became gray, and also the medial half of the left and the lateral half of the right brow. The writer believes this grayness to be due to the activity, from some unknown cause, of the pigmentophages described by Metschnikoff. HIRSCHMANN.

PANAS (513) modified his ptosis operation by excising the skin folds lateral to the upper incision in the brow and increased its cosmetic effect. He also operated in Motais's manner, utilizing a portion of the superior rectus tendon, but without any result whatsoever, as well as producing an insufficiency of the muscle and diplopia, which, according to Motais, passes off in two months, but here persisted six months, and necessitated the loosening of the tendon. Then he relieved the ptosis by means of his own operation.

V. MITTELSTÄDT.

#### IX.—LACHRYMAL APPARATUS.

514. **de Lapersonne.** Syphilitic dacryoadenitis. *Arch. d'ophth.*, xxii., 12, p. 760.
515. **Lundsgaard.** Do the lachrymal glands atrophy after extirpation of the sac? *Hosp. Tid.*, July, 1902.
516. **Berger.** On epiphora as an initial symptom of Basedow's disease. *Arch. f. Augenheilk.*, xlv., 2, p. 113.
517. **Panas.** Syphilis of the lachrymal passages. *Arch. d'ophth.*, xxii., 12, p. 749.

518. **Adolph.** On extirpation of the lachrymal sac. *Zeitschr. f. Augenheilk.*, viii., 4, p. 441.

DE LAPERSONNE (514) observed in an alcoholic patient of forty, who denied syphilis, a quickly developing bilateral inflammation of the lachrymal glands. Associated with this there was a tedious but painless irido-choroiditis in both eyes and inflammation of the pubic, chest, and salivary glands. Under anti-syphilitic treatment the inflammation of the lachrymal glands gradually receded, while the irido-choroiditis scarcely improved in six weeks. Finally the latter improved and the affection of the glands was reduced to an induration. The writer believed the process to be syphilitic, and thinks that syphilitic affections of the lachrymal glands are not so rare as is commonly supposed. He adds another case in which, following a chancre of the upper lid, the lachrymal sac became involved as a secondary symptom. V. MITTELSTÄDT.

BERGER (516) presents several observations of epiphora which seemed to precede Basedow's disease by several years. He believes the cause to be a vasomotor neurosis of the sympathetic which supplies the sac, analogous to the other secretory neuroses found in Basedow's disease—hypersecretion as well as the diminution of lachrymal secretion often observed. There is nothing characteristic about the epiphora and it can be improved only by treatment of the general condition; an extirpation of the gland is contra-indicated because of the probability that the secretion will be much reduced later.

PANAS (517) reported a very unusual case of gumma of the lachrymal sac. The patient, aged forty-five, alcoholic, acquired syphilis at the age of twenty and suffered from ozæna with occasional swelling of the region of the left lachrymal sac. The great fungous ulcer and the coexisting tertiary ulcers of the hypertrophied tonsils were cured by inunctions and hypodermic injections of an oily solution of biniodide of mercury. Panas advised against the simultaneous use of iodide of potassium in such cases. In the literature he found but three analogous cases, and he discussed the differential diagnosis between gumma, tuberculosis, and malignant tumors of the sac. V. MITTELSTÄDT.

ADOLPH (518) records five hundred and sixty-six cases of extirpation of the sac from Kuhnt's clinic, 4.8% of which healed by second intention. He prefers Kuhnt's technique and regards later modifications as being of little importance. Axenfeld's



speculum does not fulfil its purpose of checking the flow of blood and it tears the tissues.

# X.—ORBIT AND NEIGHBORING CAVITIES.

519. **Vossius.** Two rare cases of orbital affection. *30th Heidelberg Ophth. Soc. Report*, 1902. Bergmann, Wiesbaden.

520. **Lindner.** On Krönlein's operation. *Inaug. Dissert.*, 1902, Giessen.

521. **Panas.** Oily cysts in the orbital region. *Arch. d'opht.*, xxii., 12, p. 741.

522. **de Lapersonne.** Orbital and ocular complications of inflammation of the sinuses. *Bull. et mém. d. l. soc. franç. d'opht.*, 1902, 1.

523. **Axenfeld.** A contribution to the pathology and therapy of inflammations of the frontal and ethmoidal sinuses and their orbital complications. *Deutsche med. Wochenschr.*, 1902, No. 45, p. 713.

524. **Bull, C. S.** Cellulitis of the orbit, eyelids, forehead, and cheek following an infected sore of the finger. Treatment by free incisions and subcutaneous injections of sublimate. *Med. News*, Dec. 6, 1902.

VOSSIUS (519) discusses cases of orbital phlegmon in which at the autopsy abscesses were found in the ocular muscles, which partly explain the disturbances of motility. He records also a case of necrosis of the ball from orbital phlegmon, in which after various ocular and general affections had existed for years the autopsy revealed extensive actinomycosis.

LINDNER (520) considers Kronlein's operation superior to Knapp's because of the larger field of operation in the orbit secured, so that by its means, for example, even the ciliary ganglion can be removed in glaucoma. It is therefore indicated in orbital phlegmon and in infected wounds, while in tumors of suspected malignancy the greater inspection that it permits is an advantage. The immediate injuries, such as ptosis and the limitation of motility of the ball, improve or disappear in the course of time. It is not so severe that it need be avoided for diagnostic purposes, as two new cases of Vossius show—orbital tumor having been diagnosed and normal orbits found.

PANAS (521) removed from the upper-inner margin of the orbit in a girl of ten an oily cyst as large as a pigeon's egg, which had been noticed in the first year of life, but recently had grown rapidly. He found as in three other cases that the superficial wall was composed of connective tissue free from epithelium, while the deep periosteal wall presented a dermoid structure with numerous subaceous glands, a condition explainable by the action on the anterior wall of the growth of the tumor, if one does not



believe that the cyst has arisen from a detached bit of skin included within the tissues. The writer discussed also the differential diagnosis and the treatment. v. MITTELSTÄDT.

The valuable paper by DE LAPERSONNE (522) is not adapted to brief abstracting. He discusses his personal experiences of the symptoms, interesting to ophthalmologists and rhinologists, in diseases of the cavities neighboring the orbit and the various operative methods of treating sinus diseases. BERGER.

A frontal sinus chronically inflamed and causing orbital inflammation should always be chiselled out and radically operated upon, but AXENFELD (523) believes that acute processes do not always require operation, since they may heal spontaneously, while the orbital suppuration, having no outlet, may extend farther. He recommends exploratory trephining as far away as possible from the orbital abscess.

#### XI.—CONJUNCTIVA.

524 A. **Sprenker.** On the relation of scrophulosis to the common conjunctival and corneal diseases of childhood. *Inaug. Dissert.*, Giessen, 1902.

525. **Demicheri.** Spring catarrh. *Arch. d'opht.*, xxii., No. 10, p. 634.

526. **Terson.** Remarks on conjunctival vegetations recurring in the spring, their structure and their treatment. *Ann. d'ocul.*, cxxviii., p. 330.

527. **Armaignac.** On a case of congenital purulent ophthalmia. *Ibid.*, p. 241.

528. **Fries.** On the treatment of blennorrhœa by Kalt's method. *Inaug. Dissert.*, Tübingen, 1902.

529. **Raehlmann.** On the involvement of the tarsus and lid margin in trachoma. *Arch. f. Augenheilk.*, xlvi., 3, p. 363.

530. **Jacovides.** Trachoma and purulent ophthalmia in Egypt. *Arch. d'opht.*, xxii., 12, p. 767.

531. **Holmström.** Cases of pemphigus of the conjunctiva. *Hygeia*, July, 1902.

532. **Hoppe.** The extension of the retrotarsal conjunctiva upon the upper tarsus. *Monatsbl. f. Augenheilk.*, xl., ii., p. 233.

SPRENKER (524 A) finds from the histories in the Giessen clinic that in only 47 % of the so-called scrofulous ocular affections were there evidences of scrofula, swelling of the glands, eczema, and rhinitis; pronounced tuberculous affections were found in but 2 %. The cornea was more frequently affected (75 %).

DEMICHERI (525) observed spring catarrh in 0.34 % of his cases, chiefly in the form of a disease of the tarsal conjunctiva upon which there were true papillomata. The disease has no relation to

trachoma, which is prevalent in Montevideo. He recommends rubbing the hypertrophied papillæ with calomel, the use of a salve containing white precipitate and cocaine, scraping off the papillæ, and electrolysis, the last although a tedious procedure quickly improving the subjective symptoms. In one case, after removing the papillæ and cauterizing the base, there was a recurrence. (The reviewer has had the same experience.)

V. MITTELSTÄDT.

TERSON (526) finds by anatomical examination that spring catarrh consists chiefly in a hypertrophy of the papillæ. In many cases a relation between spring catarrh and eczema seems probable. By way of treatment Terson recommends yellow oxide of mercury,  $\frac{1}{40}$  -  $\frac{1}{20}$ , in lanolin, and for the secretion protargol, cocaine, adrenalin, and as general measures arsenic and life in high altitudes.

BERGER.

ARMAIGNAC (527) reports a case of congenital blennorrhœa ending in bilateral blindness. Armaignac believes with Kraus of Vienna that gonococcus infection of the vagina may extend into the cavity of the uterus, and that the gonococci pass through the foetal membranes and enter the amniotic fluid.

BERGER.

FRIES (528) confirms the favorable results of Kalt's irrigation method in the blennorrhœa of infants and adults even when there are complicating corneal affections. Since this treatment can be carried out without difficulty and without injury it may be left in the hands of the uninstructed.

RAEHLMANN (529) believes that the grooved curve in the tarsus in trachoma is due to the fact that the consistency of the tarsus itself is altered in trachoma. He believes the beginning of the trachomatous tarsitis to lie in an interstitial blepharitis with swelling about the Meibomian glands and ducts, altering the secretion. He concludes that the tarsus becomes involved at the same time that follicles appear on the tarsal conjunctiva. When cicatricial contraction of the conjunctiva occurs, the softened tarsus curves.

In the portion of his paper that has appeared JACOVIDES (530) combats the idea that the trachoma found in Egypt is distinguished by its severer course from European trachoma. The difference consists only in the fact that of every 10 cases of eye-disease 6-7 are trachomatous. The disease comes on insidiously and therefore is not followed from the beginning unless,

like the writer, one examines at intervals the eyes of healthy persons living with the trachomatous. From the histories of two foreign and two native patients it appears that first a hyperæmia of the tarsal conjunctiva comes on at the outer angle, which extends over into the retrotarsal fold and leads to a thickening of the tissues in which the granulations develop. Variations of this type, such as papillary and mixed trachoma, are found here as in Europe. The latter are found particularly in children from two to twelve years of age. As elsewhere the lower classes are chiefly affected. The prevalent humidity has a very unfavorable influence on the subjective symptoms.

V. MITTELSTÄDT.

HOLMSTRÖM (531) describes four cases observed by him of essential shrinking of the conjunctiva. Case 1.—In a woman of forty-five the conjunctival sac gradually cicatrized without visible formation of vesicles. Treatment with arsenic was of no avail. Final result: xerophthalmus. Vesicles were not observed on other parts of the body. Case 2.—A similar cicatrization was gradually developed in a woman of twenty-two. At the same time pemphigus vesicles appeared on the mucosa of the mouth. Treatment with arsenic seemed in this case to be of some efficacy inasmuch as the ocular affection had made no progress in the last six months. The cornea at the time of publication was practically uninvolved. The patient was under observation over a year. Case 3.—A man of fifty. In this patient the ocular affection was accompanied by the formation of pemphigus vesicles in the mouth. Treatment with arsenic brought the ocular affection to a temporary stop. At the time of publication the conjunctivæ were almost obliterated, the corneas clear. The patient was under observation about a year. Case 4.—A woman of twenty-four had a completely developed xerophthalmus of five years' duration.

DALÉN.

HOPPE (532) does not agree with Straub that the cicatricial tarsal mucosa in cases of cured trachoma has been drawn over from the retrotarsal folds, but he believes that it is due to loosening of the mucosa from the tarsus and traction upon it. In a case in which no trachoma existed, Hoppe saw, without any inflammatory symptoms, but with the formation of concretions and connective tissue, a diffuse progressive sclerosis of part of the upper palpebral conjunctiva, drawing over the free conjunctiva of the lid onto the tarsus. The process is somewhat similar to the formation of pterygium.



XII.—CORNEA.

533. **Reiss.** On cystic formations on the surface of the cornea. *Klin. Monatsbl. f. Augenheilk.*, xlii., p. 227.

534. **Gallemaerts.** The treatment of keratitis by electrolysis. Brussels, 1901.

535. **Weinstein.** On the healing of incised wounds of the cornea. *Wjest. ophth.*, 1902, 4-5.

536. **Suker.** A fistula of the cornea with a hernia of the iris and a cyst of the conjunctiva connected with the anterior chamber. *Ophth. Record*, Sept., 1902.

REISS (533) found in a blind eye of normal size the entire corneal region filled with cysts that lay before the cornea and were formed of conjunctiva that had been drawn over it. This had followed ophthalmia neonatorum fourteen years before. Furthermore he found chalk in the scar, bone in the choroid, and thickening of the lamina vitrea.

GALLEMAERTS (534) uses electrolysis in pannus, ribbon-shaped keratitis, and scrofulous corneal ulcers. The negative pole is used with a current of 2 m.a. This procedure causes but little irritation and improves quickly the old cases, soon causing a cessation of the photophobia.

WEINSTEIN'S (535) investigations led to the following results:

1. An hour after the cornea had been incised the wound contained only a plug of fibrin; immediate contact between the central lamellæ of the substantia propria was observed only in one small wound among 200 cases.
2. Four hours after the injury the epithelium is clearly seen dipping into the wound. Twenty-four to forty-eight hours later the entire anterior portion of the wound is filled with epithelium.
3. This indipping is due to an active process of proliferation shown by the existence of kariokinetic figures in the epithelial cells.
4. This process reaches its highest point in four hours.
5. There is no regularity in the distribution of the mitoses on the surface of the cornea.
6. In the epithelium which fills the wound the most varied kariokinetic figures are seen four hours after the operation.
7. The kariokinetic process diminishes toward the end of the first twenty-four hours but does not cease entirely.
8. There is always a superfluity of the epithelium filling the wound.
9. As the regeneration of the substantia propria proceeds under the epithelium the epithelial plug is forced out.
10. The epithelium in the region of the wound never returns to the normal but is two to



four times as thick and fills up the space left by the retraction of the scar.

In regard to Descemet's membrane, the writer differs from all others in believing that it is replaced after penetrating wounds, becoming in four months as thick as before.      HIRSCHMANN.

SUKER (536) describes a cyst of the sclero-corneal margin *10mm* long, *5mm* broad, and *5mm* deep, which was connected with the anterior chamber and contained a knuckle of iris. The cyst was laid open and the base scraped, after which there was no recurrence.      ALLING.

## BOOK NOTICES.

XVI. — **Hermann von Helmholtz**, von LEO KÖNIGSBERGER. Vieweg & Sohn: Braunschweig, 1902. In three beautifully printed 8vo volumes with 9 heliogravures and a facsimile of a letter.

This excellent biography is worthy of the great scientist. The author gives an extensive history of the life and achievements of Helmholtz, which the reviewer can only sketch in this place, expecting to furnish for the January number of these ARCHIVES a condensed but detailed account of Helmholtz's work, based on the admirable volumes of Professor Königsberger of Heidelberg.

Helmholtz's father was a professor at the Lyceum of Potsdam (Prussia), teaching Latin and Greek classics, and mathematics. His mind had a turn toward philosophy, with devotion to Kant and Fichte. Helmholtz, born Aug. 31, 1827, was not remarkable as a child, but from his eighth year his progress at school was equal to the better scholars of his class, with the addition of a bias and aptitude for architectural and geometrical constructions. In the Lyceum he took up all the prescribed studies of the regular course, and some optional ones, among which was Hebrew. In his eighteenth year he passed the examination of maturity, receiving a "very good" certificate. His love of mathematics and natural science induced him to ask his father whether he could not make these studies his life work. His father replied: "You can, if you include medicine." Accepting the proposition, he entered the Military Medical School of Berlin, where he graduated with honor. In his inaugural dissertation ("De Fabrica Systematis Nervosi Evertebratorum"), November 2, 1842, he described an important microscopical discovery, namely, the connection of nerve fibres with ganglion cells, by which the latter were recognized as nerve-cells. From now there followed an uninterrupted series of discoveries and inventions: the nature of putrefaction and fermentation, 1843; after this a number of

papers to demonstrate the great law of the universe, the *preservation of force* (the constance of energy), which he proved for the organic nature as well as for the inorganic (1849 and 1850); the *invention of the ophthalmoscope* was in 1851. In the year 1849 he was appointed professor of physiology at Königsberg, where he determined, in 1850, the *velocity of the nerve-current*, by means of an instrument to *measure smallest intervals of time*, and he made other more extended experiments on kindred subjects; in 1852, on the *theory of compound colors*. In 1855 there appeared his celebrated paper on the "Accommodation of the Eye," in *Graefe's Archiv*, and the first part of his *great treatise on Physiological Optics*.

In 1855 he was appointed professor of anatomy and physiology in Bonn; in 1858 professor of physiology in Heidelberg, where he remained until 1871, to follow a call to Berlin as professor of physics, where he and his friend Dubois-Reymond divided themselves into the new large physico-physiological Institute. In Heidelberg he founded in conjunction with Bunsen and Kirchhoff, "a period of splendor as it rarely existed in any university, and not easily will be seen again." There he wrote the greater part of his large *Handbuch der Physiologischen Optik*, the first part of which appeared in 1856, the second in 1860, the third and last in 1866. He carefully went over the whole field, critically re-examining every subject, proving, amending, and correcting any question, then presenting it historically and scientifically, so simply and concisely as clearness would permit. He resorted frequently to the aid of mathematics, but rarely in a higher grade than which is taught in any reputable college. This large and fundamental work was translated into French by Dr. E. Javal, of Paris; it soon was out of print, and a second edition was prepared by Helmholtz himself, assisted by Prof. Arthur König. It has a complete bibliography of every original publication on physiologic optics. The first edition was published as Bd. ix. of Karsten's *Allgemeine Encyclopädie der Physik*, the second by Leopold Voss, Hamburg and Leipzig, 1896. Besides this treatise he wrote another, *Die Lehre von den Tonempfindungen*, 1863. This is a smaller work, but contains the result of most remarkable investigations, especially on the *Clangcolor (timbre)* of vowels, which, besides pitch and intensity, is a quality of sound that had not previously been accounted for. A considerable number of other investigations on sound were published as independent

papers and in his *Sensations of Sound*. During these occupations in ophthalmic and aural physiology, he took up new questions of interest in general physics. He made repeated journeys abroad, to France and especially to England. In 1893 he visited America as a delegate to the committee which was commissioned to determine, at the Exposition of Chicago, international units of certain electrical values and energies.

He was married twice, first to Olga von Velten, and then to Anna, daughter of Professor, and later Minister, Rob. v. Mohl. He died in 1894, survived by a son of his first wife, a manufacturing engineer, and two sons (who are dead), and a daughter of his second wife, who is married to a son of the celebrated electrician and naturalist, Werner von Siemens, of Berlin. She has several children.

In concluding these notes, we desire to say that the Helmholtz-Biography by L. Königsberger is a classical work, elegant and fascinating in style, as instructive as it is attractive, portraying a remarkable period in the progress of science and civilization, by the insight we gain into the personality, character, and working habits not only of one of the foremost naturalists but of many of the keenest minds of his time, his co-operators, with whom he was in constant touch by friendly and literary intercourse.

H. KNAPP.

**XVII.—A Handbook of the Diseases of the Eye and their Treatment.** By HENRY R. SWANZY, A.M., M.B., F.R.C.S.I. Eighth edition, with 168 illustrations, 565 pages in 12mo, with a good index. Price, \$2.50. Philadelphia: P. Blackiston's Son & Co., 1903.

A text-book at the eighth edition requires no recommendation, if the author takes care not to lag gradually in the race. This new edition has received many additions, viz.: Conjunctivitis Petrificans, Grating Keratitis, Keratitis Aspergillina, Pflüger's Method of Tarsorrhaphy, more detailed accounts of Sympathetic Ophthalmitis, of Kuhnt's Method of Extirpating the Lachrymal Sac, the Use of the Magnet for Foreign Bodies in the Eye, Tumors of the Optic Nerve, Krönlein's Temporary Resection of the Outer Wall of the Orbit, a description of Amaurotic Family Idiocy, and others. Chapter II. (33 pages) — Refraction and Accommodation — is insufficient for an ophthalmic practitioner. The admission of kindred forms of corneal opacities of a mild chronic character, which have received attention during the last



few years only, into text-books is seasonable and praiseworthy,—we mean the Grating Keratitis of Haab, the Guttate Keratitis of Groenouw, the Superficial Punctate Keratitis of Fuchs, and the Sclerosing Opacity of the Cornea, all of which have more or less the same character—dimness of sight, irregular punctate or striated opacities in a somewhat diffuse corneal haze. They are not objects of daily practice, yet sufficiently frequent that every experienced eye surgeon, in reading the descriptions, is reminded of such cases in his practice. The final clearing of the cornea, in the experience of the reviewer, is not so frequent as the descriptions would lead one to believe. The lack of efficient treatment is sorrowfully felt by patient and physician. These forms, if they damage sight more or less, terminate in blindness only exceptionally.

Fig. 60, p. 196, gives an excellent illustration of A. Critchett's case of Solid Œdema, or Elephantiasis Lymphangiodes of the Eyelids, taken from the *Trans. Ophth. Soc. U. K.*, vol. xix. There is, in this affection, almost invariably, a history of recurring facial erysipelas. Operative and other treatment yield no permanent cures. The extirpation of the lachrymal sac is carefully described. Sympathetic ophthalmia and the motions of the pupil in health and disease receive perhaps more space than their share. The diagnosis and removal of iron foreign bodies are well presented and illustrated. The ocular muscles are duly discussed.

The book being handy and well printed, warrants a good prognosis of coming out in many more editions. H. K.

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#### ANNOUNCEMENT.

We copy the following details from the *British Medical Journal*, September 12, 1903, in addition to our short announcement of the next International Ophthalmological Congress, p. 515 this volume.

Professor Dufour is President, Professor Pflüger, Vice-President, Professor Mellinger, Secretary and Treasurer of the Organizing Committee, Professor Snellen of Utrecht, President of the last Congress, is an honorary President. The Organizing Committee has issued a kind of manifesto, certain passages of which we think might well be borne in mind by all that take an active part in the organization of congresses. The Committee declares that scientific congresses have been reproached, and with reason, for failing in their aim—the advancement and diffusion of science.

The reasons for this are, first, that too much time is given up to excursions and pleasure. In the second place, the rapid publication of scientific journals renders superfluous a long journey to hear communications which could be better understood by reading. The Committee rightly insists that discussion, not the mere reading of papers, should be the chief object of these meetings. "By interchange of ideas the spark is generated that brings us new light." With the object of rendering the discussions more profitable, the Organizing Committee has made the following arrangements: Members who wish to contribute papers are requested to send their manuscripts at the same time as their subscription to Prof. Mellinger, Bâle, before May 1, 1904. The paper must be written in one of the four official languages of the Congress: English, French, German, Italian, and its length must not exceed five printed pages of the size of the official reports of the previous congresses. The papers received will be grouped according to their contents and immediately printed. They will form the first part of the printed report of the Congress, and will be sent to each member, together with his admission ticket, at least two weeks before the time appointed for the opening of the Congress. In this way each member will know the subjects to be dealt with, and will be able to prepare himself for serious discussion. The Committee suggests that by this means the reading of the papers may be dispensed with—a notable reform which may save congresses from the fate which seems otherwise to be in store for them by crumbling away under their own weight. The authors will be called upon by the President to make known in a few words the conclusions at which they have arrived, after which the discussion will at once begin. It is hoped that in this way the opinions of experienced men, who have not the time to write and publish their experiences and opinions, may be heard. The discussions will be printed and will form the second part of the official report, which will be sent to each member after the close of the Congress. Only one subject is officially proposed for discussion, namely, "To settle the question of indemnity as regards the value of an eye, lost or injured." Professor Axenfeld (Freiburg), Dr. Sulzer (Paris), and Dr. Würdemann (Milwaukee) have been invited to draw up reports on the subject, which will be printed at the beginning of the official report.

The afternoons will be given up to practical demonstrations.

Notwithstanding the somewhat austere sentiments professed by

the Committee, "cakes and ale" will not be altogether neglected. The town of Lucerne proposes to give a reception on the eve of the opening of the Congress, September 18th. On September 20th there will be an official dinner. Mountain or lake excursions are also proposed. The entrance fee, 25 fr., will entitle members to receive the official report of the Congress and to take part in the excursions.

## INDEX TO AUTHORS AND SUBJECTS OF VOL. XXXII.

---

- ABELSDORFF, Anatomy of Ganglion Cells of Retina, 146
- Anatomical Preparations, 41, 42, 47
- Anatomy, Reports on, 71, 292, 600
- Angioma of Brow (Gruening), 392
- Anophthalmos and Microphthalmos in a Chick, 276
- Aqueous, Origin of (Hamburger), 50
- Asthenopia, in Neurasthenia and Hysteria (H. Gradle), 350
- AXENFELD, Fracture of Orbit, Vitrification of Iris, 40; Nerve-Loops in Sclera, 43
- AYRES, S. C., Polypus of Lower Canaliculus, 369
- BACH, Centres of Pupillary Reaction, 36
- BALDWIN, Dislocation of Eyeball, 168
- Basedow's Disease, Epiphora an Initial Symptom of (E. Berger), 423
- BERGER, E., Epiphora in Basedow's Disease, 423
- BIELSCHOVSKY, Innervation of Interni, 47
- Blood in New-Formed Corneal Vessels (Augstein), 50
- Book Reviews, 91, 207, 316, 505, 618
- BORN, O., Treatment of Lachrymal Affections, 286
- Bright's Disease, New Ocular Reflex in, 49
- Buphthalmos in Congenital Dislocation of Lens (F. W. Marlow), 470
- Canaliculus, Polypus of Lower (S. C. Ayres), 369
- Cataract, Angelucci's Suggestion concerning Extraction of, 50; Linear Extraction of Soft (Skeel), 52; Traumatic, from Violin String, 179
- Chloride of Ethyl (Wagenmann), 38
- Chorioretinitis, Congenital, 48
- Choroid, Adenoma of (J. E. Weeks), 175, 177; Bone Formation in (T. Snowball), 273; Central Rupture of, with Good Vision (J. J. Mills), 217; Detachment of the, 182; Reports on the, 181, 485; Sarcoma of (Marple) 58; Sclerosis of the, with Secondary Degeneration of Retina (G. Levinsohn), 7; Sixty-nine Cases of Rupture of (F. E. D'Oench), 18; Tuberculosis of, with Tuberculosis of Conjunctiva (W. H. H. Jessop), 400
- Choroiditis, Circumscribed Plastic (Cutler), 175
- Ciliary Body, Epithelium of, in Naphthalin- and Ergotin-Poisoning (Peters) 36
- Color-Blindness, Color Names in Testing for (Edridge-Green), 52
- Color-Perception, Central (P. Fridenberg), 269
- Color Test for Central Vision (P. Fridenberg), 177
- Congenital Defects of Eyes, 170



- Conjunctiva, Epithelioma of (C. J. Kipp), 173; Rare Affections of the (v. Michel), 415; Reports on, 82, 407, 612; Spontaneous Hemorrhage from (Meierhof), 56; Tuberculosis of (Stephenson), 413
- Convergence and Divergence, Paralysis of (A. Duane), 282
- Cornea, Mycotic Affections of (B. Wicherkiewicz), 13; Reports on, 84, 615; Sarcoma of (Gruening), 174; Serum Therapy in Ulcers of (Roemer), 31; Tattooing of (De Wecker), 254; Traumatic Melano-Sarcoma of (Reese), 57; Vesicles on the (W. Stood), 1
- Cornea, Sclera, Anterior Chamber, Reports on, 84, 473, 615
- CUTLER, Dacryocystitis in the New-Born, 288; Circumscribed Plastic Choroiditis, 175
- D'OENCH, Sixty-nine Cases of Rupture of Choroid, 18
- DESPAGNET, Obituary Notice of, 313
- DUANE, A., Aplasia of Papilla and Macular Anomaly, 319; Paralysis of Convergence and Divergence with Paralysis of Superior Rectus, 282; Retinitis and Chorio-Retinitis, 59
- Ectropium, Fixation of Skin-Flaps in (F. C. Hotz), 209
- EDRIDGE-GREEN, Color Names, for Color Tests, 52
- ELSCHNIG, Histological Artefacts of Optic Nerve, 37
- Enophthalmos, Traumatic (E. Purtscher), 541
- Eye, Congenital Coloboma of (Hippel), 38; Congenital Cysts of the (C. Hess), 339; Dislocation of (Baldwin), 168; Endogenous Infection of the (Selenskovsky and Woizechovsky), 430; Evulsion of, with Obstetric Forceps (Snell), 51; Paralysis of Upward Movement of, 51
- Eye Patients, Mental Derangement in (C. J. Kipp), 375, 395
- FEJÉR, J., Diagnosis between Glioma and Pseudo-Glioma, 154
- FEUER, N., Obituary Notice of, 313
- Firearms, Injuries to the Eye, from (Panas), 192
- FRIDENBERG, P., Central Color-Perception, 269; Central Color Test, 177; Color-Vision Lamp, 178
- FUCHS, Scleritis Posterior, 39
- Fundus, Photograms of, of the Eye (Dimmer), 41
- GAMBLE, W. E., Double Optic Neuritis in Whooping-Cough, 359
- German Ophthalmological Society, Report of Meeting of, 31
- Glaucoma, Histology of Bullous Keratitis in (De Schweinitz and Shumway), 257; Reports on, 185, 488; Should we Operate in, when Fellow Eye Exhibits Hemorrhages (Callan), 58; Sympathectomy in Secondary (Price), 57; Tension in, Increased by Adrenalin (A. F. MacCallan), 400; (K. R. Wahlfors), 517
- GOULD, G. M., "Biographic Clinics," Notice of, 316
- GRADLE, H., Asthenopia in Neurasthenia and Hysteria, 350
- GRAEFE, A., Obituary Notice of, 313
- GREEFF, Fovea Externa in Human Retina, 45
- GRUENING, Corneal Sarcoma, 174
- GRUNERT, Septic and Metastatic Retinitis, 46
- GULLSTRAND, Color of Macula, 44
- HEINE, Rupture of Lamina Vitrea in Myopia, 45
- HERBERT, H., "The Practical Details of Cataract Extraction," Notice of, 505
- HERRNHEISER, I., Obituary Notice of, 313

- HESS, C., Congenital Cysts of Eye, 339; "Refraction and Accommodation of the Eye," Notice of, 207
- V. HIPPEL, Congenital Coloboma of Eye, 38
- HOTZ, F. C., Fixation of Skin Flaps in Ectropium, 209
- HUNTER, Probes in Lachrymal Affections, 288
- Infants, Dacryocystitis in (Cutler), 288
- Injuries, Foreign Bodies and Parasites, Reports on, 191, 497
- Injuries, Location of Endogenous (Stock), 39
- INOUE, T., Obituary Notice of, 313
- Instruments and Remedies, Reports on, 41, 68, 205, 599
- International Ophthalmological Congress, 515 and 620
- Interni, Innervation of (Bielschowsky), 47
- Iridochoroiditis Syphilitica (Krueckmann), 43
- Iris, Indirect Ruptures of (G. Levinsohn), 134; Reports on, 89, 484
- Iritis, Rheumatic, Discussion on (A. Paine and F. J. Poynton), 399
- JAVAL, E., "Entre Aveugles" (among the Blind), Notice of, 513
- Keratalgia after Injuries to Cornea (W. Stood), 1
- Keratitis Punctata (Koller), 55
- KIPP, C. J., Epithelioma of Conjunctiva, 173; Mental Derangement in Eye-Hospital Patients, 375, 395
- KNAPP, A., Empyæma of Ethmoid and Frontal Sinuses with Exophthalmos, 214; Extirpation of Lachrymal Sac, 290, 372; Hydrops of Optic-Nerve Sheath, 285; Localized Tuberculosis at Head of Optic Nerve, 22
- KOENIGSBERGER, L., "Life of Helmholtz," Notice of, 617
- KOLLER, Keratitis Punctata, 55
- KRUECKMANN, Iridochoroiditis Syphilitica, 43
- Labor, Injuries to the Eye, during (E. Thomson and L. Buchanan), 276
- Lachrymal Affections, Discussions on, 286
- Lachrymal Apparatus, Reports on, 81, 307, 609
- Lachrymal Sac, Extirpation of (A. Duane), 389, (A. Knapp), 290, 372; Lachrymation after Removal of (Schirmer), 44
- LAMBERT, X-Rays in Epithelioma of Lid, 55
- Lamp for Color Vision (P. Fridenberg), 178
- Latero-Version, Paralysis of (O. Wernicke), 163
- Leber's Disease, Recovery of Sight in (E. Nettleship), 169
- Lens, Clearing of Opacity of, 389; Eyelash in (Wolff), 58; Reports on, 88, 480
- Lenticonus Posterior (J. E. Weeks), 56
- LEVINSOHN, G., Indirect Ruptures of Iris, 134; Sclerosis of Choroid, with Secondary Degeneration of Cornea, 7
- LEWIS, Double Hemorrhagic Neuroretinitis, 388; Probes in Lachrymal Affections, 288
- Lid, X-Rays in Epithelioma of (Lambert), 55
- Lids, Chancre of (Hunter), 172; Rare Affections of the (v. Michel), 415; Reports on, 79, 306, 608; Trachomatous Affections of (Raehlmann), 32
- LIEBRECHT, Optic Nerve in Brain Tumor, 48
- Literature, Reports on General Ophthalmological, 62, 197, 593
- LITTLE, D., Obituary Notice of, 312

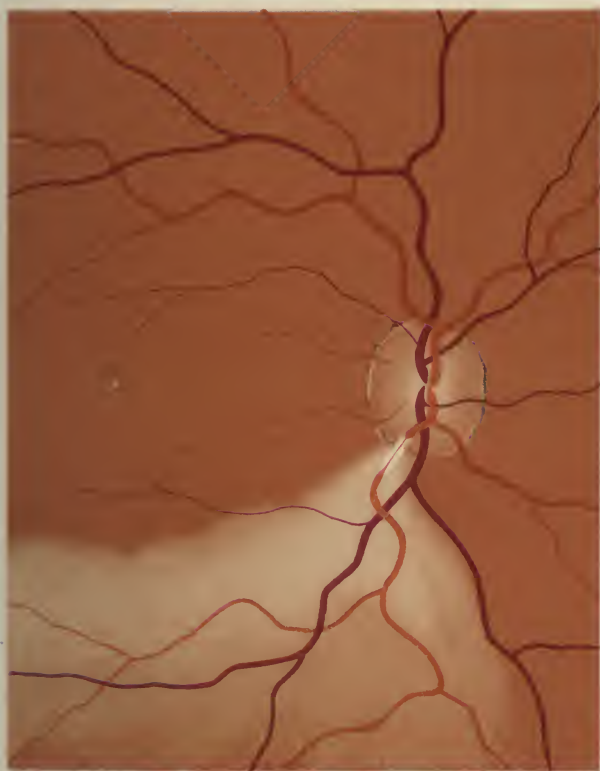
- LOEB, C., Ophthalmoscopic Examinations for Diagnosis between Typhoid Fever and Acute Miliary Tuberculosis, 453
- Macula, Color of (Gullstrand), 44
- MADDOX, E., "Golden Rules of Refraction," Notice of, 515; "Motor Disturbances of the Eye," Notice of German translation, 95
- MAGENNIS, E., "Eye Symptoms as a Guide in Diagnosis," Notice of, 515
- Magnets, Conclusions Concerning (Volkmann), 43
- MARLOW, F. W., Buphthalmos in Congenital Dislocation of Lens, 470
- MARPLE W. B., Divergent Strabismus, 280
- MAY, J. W., Obituary Notice of, 313
- MAYOU, S., X-Rays in Trachoma, 275
- MEIERHOF, Spontaneous Conjunctival Hemorrhage, 56
- V. MICHEL, J., "Klinischer Leitfaden der Augenheilkunde," Notice of, 512
- MILLS, J. J., Central Rupture of Choroid, Retention of Good Vision, 217
- Mules's Operation with Paraffin, 58
- Muscles and Nerves, Reports on, 76, 300, 605
- Myopia, Black Spot at Posterior Pole, in (A. Schapring), 282; Rupture of Lamina Vitrea in (Heine), 45
- Nerves, Birth-Palsy of Sixth and Seventh (E. Nettleship), 168
- NETTLESHIP, E., Birth-Palsy of Sixth and Seventh Nerves, 168; Recovery of Sight in Leber's Disease, 169
- Neuro-Retinitis, Double Hemorrhagic (Lewis), 388
- New York Academy, Reports of Ophthalmological Section of, 54, 172, 279, 388, 392
- Obituary Notices, 310
- Ocular Disturbances in General Diseases, Reports upon 194, 500
- OPDYKE, Trachoma and Adenoids, 60
- Ophthalmological Society of the United Kingdom, Reports of, 51 168, 272, 399
- Ophthalmology, Reports of Progress in, 62, 181, 197, 292, 402, 473, 593
- Ophthalmoplegia, Traumatic, Bilateral (H. H. Tyson), 394
- Optic Nerve, Atrophy of (J. Wolff), 394; Histological Artefacts of (Elschnig), 37; Hydrops of Sheath of (A. Knapp), 285; Localized Tuberculosis of Head of (A. Knapp), 22; Pathology of in Brain Tumor (Liebrecht), 48; Primary Extradural Tumors of (J. H. Parsons), 272; Reports on Diseases of the, 190, 497; Tumor of, with Krönlein's Operation (L. Werner), 274
- Optic Papilla, Aplasia of, and Macular Anomaly (A. Duane), 319; Hyaline Bodies at (A. S. Morton and J. H. Parsons), 272
- Ora Serrata and Ciliary Processes, Ophthalmoscopic Appearances of (M. Reimar), 130
- Orbit, Dermoid Cyst of (Lediard), 170; Pathology of Fracture of (Axenfeld), 40; Rare Affections of (Vossius), 49; Reports on the, 82, 402, 611
- PAINE, A., and POYNTON, F. J., Rheumatic Iritis, 399
- PANAS, O., Obituary Notice of, 310
- Panophthalmitis, of Reapers, 49; Without Perforation (J. E. Weeks), 179
- Paraffin, Injections of, after Enucleation, 389
- PARSONS, J. H., "The Ocular Circulation," Notice of, 511
- Pathology, Diagnosis, and Therapeutics, Reports on, 64, 200, 596
- PERCIVAL, A. S., Periscopic Lenses, 367
- Periscopic Lenses (A. S. Percival), 367

- PETERS, Ciliary Body in Naphthalin- and Ergotin-Poisoning, 36
- PFUEGER, General Narcosis, 39
- PHILLIPS, R. J., "Spectacles and Eyeglasses," Notice of, 207
- Physiology, Reports on, 72, 293, 601
- POSEY, W. C., and WRIGHT, J., "Treatise on Diseases of the Eye, Nose, Throat, and Ear," Notice of, 91
- POYNTON, F. J., Rheumatic Iritis, 399
- Proptosis, with Head Deformity, 401
- Pupil, Centres of Reaction of (Bach), 36; Condition of, after Sympathetic Resection (Levisohn), 49
- PURTSCHER, E., Contribution to Traumatic Enophthalmos, 541
- PUSEY, BROWN, Cytotoxins and Sympathetic Ophthalmia, 334; Retinal Rosette Formations of Neuroglia, 325
- RAEHLMANN, Trachoma of Lids, 32
- REESE, Melano-Sarcoma of Cornea, 57
- Refraction and Accommodation, Reports on, 74, 298, 602
- REIMAR, M., Embolism of the Central Retinal Artery, 552; Ophthalmoscopic Appearance of Ora Serrata and Ciliary Processes, 130
- Retina, Anatomy of Ganglion Cells of (Abelsdorff), 146; Diagnosis between Glioma and Pseudoglioma of the (J. Fejér), 154; Embolism of Central Artery of the (M. Reimar), 552; Fovea Externa in (Greeff), 45; Pathology of Abnormal Vessels and Striæ in (R. Schilling), 219; Rosette Formations of Neuroglia (Pusey), 325
- Retina and Functional Disturbances, Reports on, 186, 493
- Retinitis, and Chorio-Retinitis (A. Duane), 59; Pigmentosa in Five Generations (Snell), 51; Septic and Metastatic (Grunert), 46
- ROEMER, Serum Therapy and Corneal Ulcers, 31
- Sarcoma, Primary Epibulbar (F. H. Verhoeff and R. G. Loring), 97
- SCHAPRINGER, A., Black Spot at Pole of Myopic Eye, 282
- SCHILLING, R., Pathology of Abnormal Vessels and Striæ in Retina, 219
- SCHIRMER, Lachrymation after Removal of Sac, 44
- DE SCHWEINITZ and SHUMWAY, Histology of Bullous Keratitis in Glaucomatous Eyes, 257
- Sclera, Nerve-Loops in (Axenfeld and Naito), 43; Rupture of (Emerson), 393
- Scleritis Posterior (Fuchs), 39
- SCOTT, K., Accuracy in Vision-Testing, 123
- SEABROOK, Amber-Yellow Glass, in Eye Diseases, 390
- SELENKOVSKY and WOIZECHOVSKY, Endogenous Infection of the Eye, 430
- SHUMWAY, E. A., Bullous Keratitis in Glaucoma, 257
- Sinuses, Empyæma of Ethmoid and Frontal (A. Knapp), 214
- SKEEL, Linear Extraction of Soft Cataract, 54
- SNOWBALL T., Bone-Formation in Choroid, 273
- SNYDACKER, E. F., Prevention of Symblepharon, 25
- STOCK, Location of Endogenous Injuries, 39
- STOOD, W., Vesicles on the Cornea, and Keratalgia after Injuries of Cornea, 1
- Strabismus, Divergent (W. B. Marple), 280
- SUTER, W. N., "The Refraction and Motility of the Eye, for Students and Practitioners," Notice of, 508
- SWANZY, "Handbook of the Diseases of the Eye and their Treatment," Notice of, 619



- Symblepharon, Prevention of, after Burns (E. F. Snyder), 25  
Sympathectomy (J. E. Weeks), 172  
Sympathetic Ophthalmia, and Cytotoxins (Brown Pusey), 334; Cataract Extraction after (J. E. Weeks), 279; Reports on, 186, 492  
Synechia, Operation of Anterior, (Koller), 58  
TERRIEN, "Surgery of the Eye" ("Chirurgie de l'Œil et de ses Annexes"), Notice of, 96  
THOMSON, E., and BUCHANAN, L., Injuries during Labor, 276  
Trachoma, and Adenoids, 60; Forceps, 177; X-Rays in Treatment of (S. Mayou), 275  
Typhoid and Acute Miliary Tuberculosis, Use of Ophthalmoscopic Examinations in Diagnosis between (C. Loeb), 453  
UHTHOFF, Visual Disturbances in Brain Injuries, 48  
VEAZEY, C. A., "A Manual of Diseases of the Eye, for Students and General Practitioners," Notice of, 507  
VERHOEFF, F. H., and LORING, R. G., Primary Epibulbar Sarcoma, 97  
Vision, Accuracy in Testing (K. Scott), 123  
Vitreous, Reports on, 184, 487  
VOLKMANN, Eye Magnets, 43  
WAGENMANN, Chloride of Ethyl, 38  
WAHLFORS, K. R., Glaucoma, 517  
DE WECKER, Tattooing of Cornea, 254  
WEEKS, J. E., Cataract Extraction after Sympathetic Ophthalmia, 279; Panophthalmitis without Perforation, 179  
WERNER, L., Optic-Nerve Tumor, Krönlein's Operation, 274  
WERNICKE, O., Paralysis of Latero-Version, 163  
Whooping-Cough, Double Optic Neuritis in (W. E. Gamble), 359  
WICKERKIEWICZ, B., Mycotic Affections of Cornea, 13  
WOLFF, Skiascopy, 44  
WORTH, C., "Squint: Its Causes, Pathology, and Treatment," Notice of, 509  
Yellow-Amber Glass in Eye Diseases (Seabrook), 390

Fig. 1.















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